

# **INTERACTIVE SCOTCH<sup>®</sup> LASER VIDEODISC.**

*Part of paper 76*

**For communications that bring your audience to its feet.**





### ***Interactive Scotch® Laser Videodisc keeps viewers on their toes.***

Interactive videodisc keeps everyone interested by letting the viewers select the parts of the presentation that interest them most.

Simply by using a light pen or pressing a touch-screen monitor with a finger, viewers can search out specific sequences and skip past others. Answer questions or replay a complicated section. Even freeze individual frames for a closer look.

Videodisc presentations can make use of slides, film, and video tape all in one medium, with exceptional picture quality and dual-track sound for stereo audio or bilingual communications. The capabilities of interactive videodisc result in more effective sales presentations and training programs. Increased viewer involvement enhances learning and retention. And videodisc also brings a new degree of convenience and economy to information storage, because any of up to 54,000 video frames can be retrieved within a few seconds from one side of a single 12" disc.

### ***3M's high standards of quality and service keep us on our toes.***

As a manufacturer of custom laser videodiscs, 3M can give you what you need, when you need it. Our quality and service are second to none. In some cases, we can offer 3-day turnaround from video tape premaster to disc. We can work from  $\frac{3}{4}$ " professional tape as well as 1" type C. And we can make interactive videodisc a viable alternative to other communications systems.

All over North America, people are standing up and taking notice. Interactive videodisc is no longer merely the wave of the future. It's working right now for corporations, government, hospitals, educational institutions and others. 3M is ready to make it start working for you.

**R. D. (Rich) Martinez**  
Senior Account Representative

Residence:  
609 Candlewood Street  
Brea, California 92621



**Optical Recording Project/3M**  
223-5S-01 3M Center  
St. Paul, Minnesota 55144  
714/529 3418



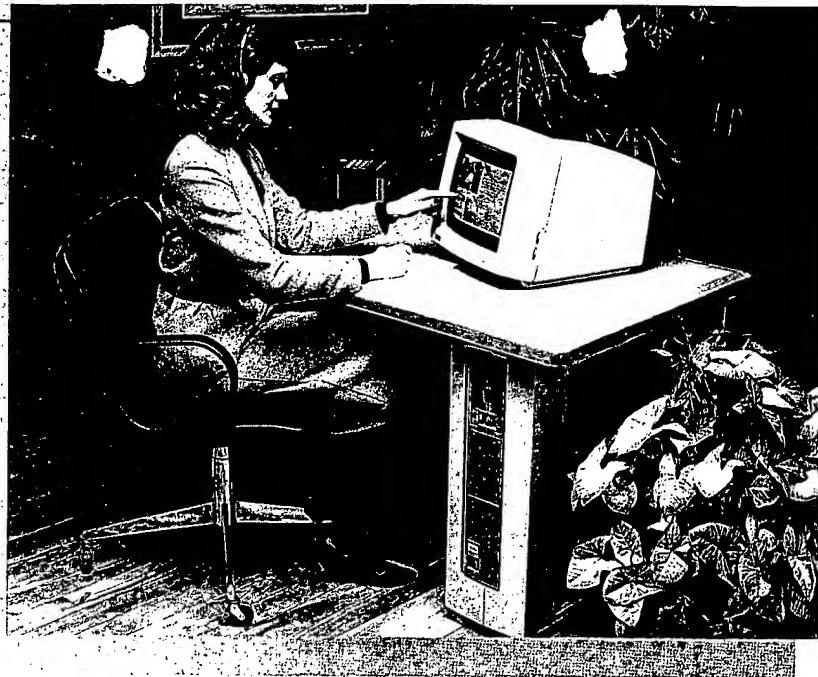
©1983 Minnesota Mining and Mfg. Co.

## Optical Recording Project/3M

223-5S 3M Center  
St. Paul, MN 55144

# 3M

"Litho in USA with 3M offset plates, film and proofing systems."



C

## **DECtouch**

### **DIGITAL'S TOUCH SCREEN COLOR MONITOR WITH IVIS SUPPORT**

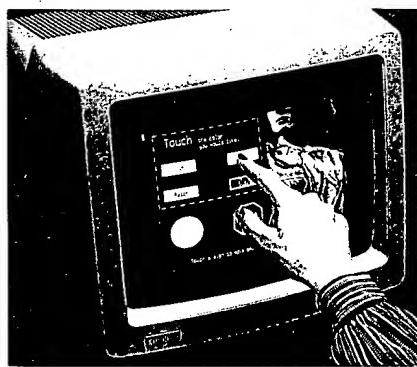
DECtouch lets both inexperienced computer users and courseware developers take full advantage of IVIS's interactive capabilities by allowing you to "talk" to the computer without words, control commands, or even a keyboard. By simply pointing a finger onto the monitor screen, the computer instantly responds.

DECtouch consists of a modified VR241 color monitor, which uses state-of-the-art resistive membrane technology to translate the precise point of your finger on the screen into input commands that are interpreted by the applications software. Mounted over the face of the color cathode ray tube, the transparent touch screen panel eliminates glare and senses input position with an accuracy of one millimeter. You can draw with a finger or soft pointer on the touch screen because it is durable, easy to clean and neither disturbs or interferes with the high-resolution monitor's picture quality.

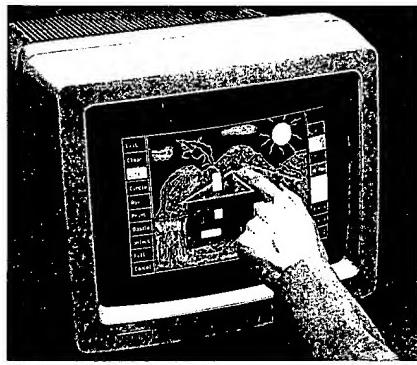
The DECtouch interface, housed in a modified VR241 monitor cabinet, consists of the touch screen panel, internal controller, board module and interactive video cable (in place of the standard color monitor cable to the Professional 350).

With DECtouch, alternate positional input devices—joystick, mouse, or graphics tablet—can be connected via the two serial and parallel connectors on the rear of the VRTS1-A housing. The DECtouch controller module (DTM), mounted in the monitor cabinet, interfaces the DECtouch screen, keyboard and alternate positional input devices to the Professional 350.

**IVIS**



*High resolution color and clarity make DECtouch ideal for relaying detailed information quickly and accurately.*



*With the DECtouch demonstration routine, you can instantly create lines, shapes and solids in any color combination at the touch of a fingertip.*

DECtouch controller firmware is included in the module to control the I/O ports, decode commands from the Pro 350, transmit data, and perform all diagnostic and self-tests.

A positional device library is provided to interface applications software to the positional device driver. Applications software can easily be modified to call the appropriate library element to connect or disconnect devices, request positional data, or change the attributes of the positional devices.

While DECtouch was developed to facilitate the design and delivery of IVIS interactive courseware, it will also support additional applications. Some examples are multiple listings services for real estate, point-of-sale information and advertising for retailers, process control and inventory listings for manufacturers, as well as CBI, on the Professional 350.

## Specifications

Specifications for the DECtouch color monitor are identical to those of the VR241 color monitor, with the following additions:

### Touch Screen

Activation force	1-2 ounces nominal (28-56 grams)
Resolution	.04 inches (1.0mm)
Sampling rate	10-400 samples/second (programmable) 100ms-2.5ms/sample corresponds nominally to 10in./sec. drawing speed
Ports	2 serial positional device attachment ports with graphics tablet and serial mouse support  2 parallel positional device attachment ports with joystick or single quadrature mouse support  1 keyboard port  Baud rate (programmable) of 5 to 19.2 K
Software support	DECtouch requires P/OS Version 1.7. A special I/O positional device driver is included with the DECtouch Control Module to interface the applications software to the keyboard.

### Environment

Operating temperature	50 to 104 degrees F. (10 to 40 degrees C.)
Relative humidity	10 to 90%

### Electrical

Input	120V nominal, Single phase, 3-wire, 87-128V rms at 47-63Hz  220-240 nominal, Single phase, 3-wire 174-256V rms at 47-63Hz
Input current	120V ac 5A rms; 220V ac 25A rms
Overload protection circuit breaker	

### IVIS Video Mode

Refresh rate	60Hz interlaced
Scan lines	525 lines interlaced
Displayed resolution (text and graphics)	960 horizontal, by 240 vertical pixels (interlaced)

RTS1-A color monitor	0.31mm dot pitch
RTS1-A weight	39 lbs. (17.7kg)

### Video Signals

Output video signal	RGB analog video signal with RS170 composite sync on green
Output video signal	RB video .7V p-p positive
Detail	G video .7V p-p positive, plus 0.34V sync
Output load	75 ohm termination
Video input voltage	1.0V p-p nominal with 0.3V negative sync tip
Voltage variation	0.47V to 1.21V p-p
Compensable external sync output	RS170 composite sync with negative sync tip 4.0V p-p into 75 ohms
External subcarrier	Frequency: 3.579545 MHz voltage: 1.0V p-p continuous into 75 ohms
Black burst output	voltage: 286mV composite sync + 286V p-p subcarrier burst into 75 ohms

**digital™**

IVIS, Professional 350 and DECtouch are trademarks of Digital Equipment Corporation.

© Copyright Digital Equipment Corporation 1984. All rights reserved.

# IVIS

## PRICE LIST

Effective January 1984

Digital supports the new IVIS Interactive Video Information System with software, courseware and consultation services to help you adapt IVIS to your organization's information and training needs quickly, reliably and cost-effectively. Digital backs all our products with a full complement of support and service, and maintains a toll free hot line for any questions we can answer for you.



### IVIS System Packages

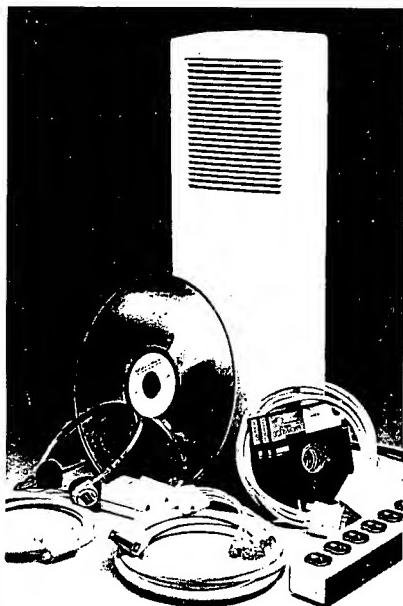
Description	Order no.	Price
PRO IVIS/Videodisc System	PC35V-VB	\$16,600.00
PRO IVIS/Videodisc Touch System	PC35V-VC	\$18,600.00

### IVIS System Components

IVIS Interactive Video Option, including floorstand "backpack" video and system modules IVIS software drivers and subroutine libraries headphones power switch color monitor cable IVIS installation and verification videodisc	PC3VS-AA	\$4,575.00
Professional 350 System Unit	PC350-D2	\$4,975.00
Country Kit	PC3K1-BA	\$245.00
Videodisc Player*	VDP40-AA	\$2,745.00
10MB Hard Disk	RCD51-A	\$2,800.00
Professional Operating System (P/OS)	QBA02-H3	\$175.00
PRO Interpreter, including binaries documentation license	QBA27-A3	\$300.00
Vertical Floor Stand	PCXXF-AA	\$99.00
13" RGB Color Monitor (for PRO IVIS/Videodisc System)	VR241-AA	\$950.00
or	or	or
DECtouch Color Monitor, including DECtouch alternate input device cable	VRTS1-A	\$3,295.00
<b>Sum of Components:</b>		
PRO IVIS/Videodisc System		\$16,864.00
PRO IVIS/Videodisc Touch System		\$19,209.00

**Note:** While all options may be purchased separately, either complete IVIS System Package is a more economical investment for a sound IVIS courseware-delivery solution.

\* Alternate videodisc players, Pioneer® Model III PR7820-3 and Sony® LDP-1000, are also plug-compatible with IVIS, but are not supported by Digital service agreements. When ordering additional VDP40 Videodisc Players, additional accessory cables must also be specified.



## Available Options

### Hardware

Personal Printer (100 characters/sec.)	LA50-RA	\$695.00
Dot Matrix Printer (240 characters/sec. draft mode, 30 characters/sec. letter and bit-map graphics mode)	LA100-PC	\$1,595.00
Letter Quality Printer (32 characters/sec.)	LQP02-AA	\$2,800.00
Printer cable	BCC05-10	\$30.00
Modem cable	BCC04-10	\$30.00
Videodisc accessory cables	PC3VX-AA	\$75.00

### Software

PRO/Communications Package	QBA05-A3	\$195.00
Applications Starter Kit	QBA25-A3	\$399.00
Furniture		
Work Table	PCXXF-CB	\$559.00

### Availability

For U.S. customers, the PRO IVIS/Videodisc System will be available late January; the PRO IVIS/Videodisc Touch System late February.

### Support Services

Digital Field Service offers a comprehensive one-year warranty for all parts and labor for each of the two IVIS System Packages. Additional service coverage is available after that time for a basic monthly charge under a standard Field Service contract.

Digital Educational Services also offers full consulting and custom courseware development services to help you take the best advantage of IVIS's capabilities. (For details, see the accompanying data sheet.)

## DECtouch

Description	Order no.	Price
DECtouch video monitor	VRTS1-A	\$3,295.00

The VC241-A extended bit-map option, which consists of the BCC03-06 interactive video cable and the VS241-A PRO color board, is required to drive the standard VR241 color monitor. This option is included with the PRO IVIS/Videodisc Touch System, but is not included in the DECtouch option alone.

### Availability

In the U.S., DECtouch will be available in February. Availability for European and GIA customers is expected to be in May.

### Support Services

A full one-year on-site warranty for all parts and labor is included.

For more information about DECtouch, please contact your local Digital Computer Special Systems marketing representative or call the CSS sales Support Team at 1-800-TEAM-CSS.



## VAX PRODUCER

Description	Order no.	Price
<b>License Only</b>		
VAX PRODUCER V1.0 (VAX 11/730)	QCO40-UZ	\$14,000.00
VAX PRODUCER V1.0 (VAX 11/750)	QDO40-UZ	\$14,000.00
VAX PRODUCER V1.0 (VAX 11/780)	QEO40-UZ	\$14,000.00
<b>Media and Documentation</b>		
VAX PRODUCER V1.0 Bin TU58 (VAX 11/730)	QCO40-HG	\$1,000.00
VAX PRODUCER V1.0 Bin 16MT9 (VAX 11/730)	QCO40-HM	\$1,000.00
VAX PRODUCER V1.0 Bin TU58 (VAX 11/750)	QDO40-HG	\$1,000.00
VAX PRODUCER V1.0 Bin 16MT9 (VAX 11/750)	QDO40-HM	\$1,000.00
VAX PRODUCER V1.0 Bin RX01 (VAX 11/780)	QEO40-HY	\$1,000.00
VAX PRODUCER V1.0 Bin 16MT9 (VAX 11/780)	QEO40-HM	\$1,000.00

The VAX PRODUCER Media and Documentation includes binaries of the VAX Design Preprocessor and Linker, VAX Draw graphics editor, VAX PRODUCER Interpreter, VAX PRODUCER CBI, and full documentation.

## VAX PRODUCER Interpreter

<b>License Only</b>		
VAX PRODUCER Interpreter V1.0 (VAX 11/730)	QCO41-UZ	\$100.00
VAX PRODUCER Interpreter V1.0 (VAX 11/750)	QDO41-UZ	\$100.00
VAX PRODUCER Interpreter V1.0 (VAX 11/780)	QEO41-UZ	\$100.00
<b>Media and Documentation</b>		
VAX PRODUCER Interpreter V1.0 Bin TU58 (VAX 11/730)	QCO41-HG	\$200.00
VAX PRODUCER Interpreter V1.0 Bin 16MT9 (VAX 11/730)	QCO41-HM	\$200.00
VAX PRODUCER Interpreter V1.0 Bin TU58 (VAX 11/750)	QDO41-HG	\$200.00
VAX PRODUCER Interpreter V1.0 Bin 16MT9 (VAX 11/750)	QDO41-HM	\$200.00
VAX PRODUCER Interpreter V1.0 Bin RX01 (VAX 11/780)	QEO41-HY	\$200.00

VAX PRODUCER Interpreter V1.0  
Bin 16MT9 (VAX 11/780)

QEO41-HM

\$200.00

The VAX PRODUCER Interpreter media and documentation includes a binary file of the VAX PRODUCER Interpreter and installation documentation.

#### Licensing Options

A license is required for each CPU. A Right-to-Copy license must be purchased for each additional CPU.

#### Support Services

The standard Software Product services, including Self-maintenance, Basic and DECservice support, are available for the VAX PRODUCER and VAX PRODUCER Interpreter. For service information, call your Digital software specialist.

### Digital Consulting Services

#### Level I: General Advice and Technical Assistance

8 hour minimum	\$ 65/hour
6 month resident service	\$ 9,724/month*
12 month resident service	\$ 9,152/month +

#### Level II: Project Leader, System Analysis/Design

8 hour minimum	\$ 85/hour
6 month resident service	\$12,716/month*
12 month resident service	\$11,968/month +

#### Level III: Project Management, Special Expertise

8 hour minimum	\$ 90/hour
6 month resident service	\$13,464/month*
12 month resident service	\$12,672/month +

#### Level IV: Advanced Level of Technical/Professional Expertise

8 hour minimum	\$ 110/hour
6 month resident service	\$16,456/month*
12 month resident service	\$15,488/month +

#### Level V: Advanced Level of Managerial/Technical Expertise

8 hour minimum	\$ 125/hour
6 month resident service	\$18,700/month*
12 month resident service	\$17,600/month +

**Note:** These rates are exclusive of travel, hotel and per diem expenses.

\*These consulting services will be discounted by 15%.

+ These consulting services will be discounted by 20%.

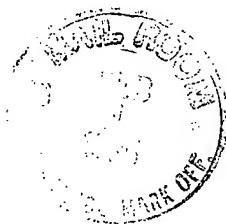
**digital™**

IVIS, DECTouch, VAX and Professional 350  
are trademarks of Digital Equipment  
Corporation.

Sony is a registered trademark of  
Sony Corporation.

Pioneer is a registered trademark of  
Pioneer Electronic Corporation.

© Copyright Digital Equipment Corporation  
1984. All rights reserved.



Price List

50

EA-30275-80 1/84



IVIS PUTS THE POWER OF  
SIGHT, SOUND AND TOUCH  
INTO YOUR  
INFORMATION PICTURE.

IVIS



# INTRODUCING

Picture adding the vivid realism of video to the intelligence and flexibility of a personal computer. Imagine using that powerful combination to tackle an old problem in a new way: to make learning exciting, effective and enduring. Picture IVIS, Digital's new Interactive Video Information System, and what it could do to brighten your training picture.

## Seeing is Believing.

People retain about 25 percent of what they hear, 45 percent of what they see and hear, and 70 percent of what they see, hear and do. With IVIS, viewers are engaged on all fronts.

You can use IVIS to show natural moving pictures or still video images of superior quality and color, and overlay them with computer-generated graphics and text, with narration (or sound effects, music or translation) from a choice of two tracks.

And the computing power of the Professional 350 lets the viewer initiate a dialogue with whatever material is presented—whether it's training in robotics or engine maintenance, flight safety, industrial automation, salesmanship or information for manufacturing process control.

## IVIS Gets the Job Done.

What this means is that you can put IVIS to work for you in any number of ways to get the job done—more quickly, dynamically and effectively than the way you've been doing it.



IVIS puts the power of sight, sound and responsiveness at the user's command. Because IVIS's Interactive Video Information System is compact and easily assembled, it is equally well suited to office, factory floor or lab use. Here, a medical administrator examines a reference file slide.



# HOW IVIS WORKS:

The key to IVIS is its responsiveness. Even a computer novice can learn to use IVIS quickly and easily, guided by video demonstrations alternated with exercises on the computer monitor. By entering commands on the keyboard or by touching a point on the pressure-sensitive DECtouch screen, you control and communicate with an interactive course or program run on a Professional 350 computer—either standalone or host-connected.

The IVIS "backpack" connects the computer with the videodisc player and synchronizes their electronic signals, so that video segments can be mixed with computer menus and programs that appear on the monitor.

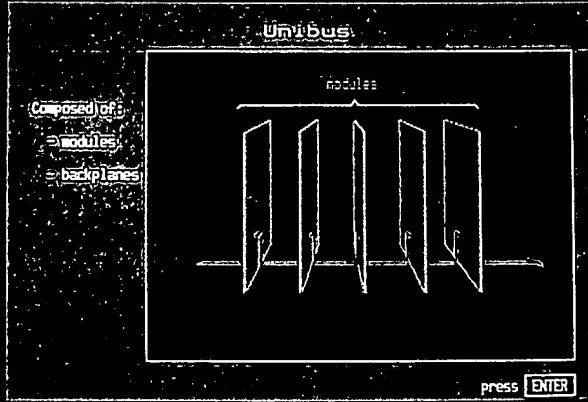
## Creating Your Own IVIS Courseware:

Behind the scenes is the VAX PRODUCER, Digital's unique software development system that allows you to create interactive IVIS programs. You can adapt any teaching technique and wide variety of media to suit the material to be conveyed. Through a design technique called branching, alternate routes can be created through a given set of program materials. Branching is what gives viewers the choice of how and when to proceed, if and when to review, and when to be tested on their understanding of the information presented.

## Instant Access to Information:

The laser videodisc is an exciting new medium because of its large storage capacity and durability. Each side of a laser disc holds up to thirty minutes of moving video, or thousands of slides—or any combination of the two—along with an hour of audio on a choice of two sound tracks. Because signals are "read" optically, laser videodiscs are practically indestructible.

The videodisc player allows you to locate any point on a disc in a matter of seconds. In addition to playing sequences at normal, high or low speeds, in forward and reverse, you can also freeze single frames or scan ahead, to examine material in depth or bypass the familiar.



The sharpness and clarity of color graphics makes IVIS ideal for highlighting complex detail and visualizing abstract concepts. Here, for example, the red path of electrical current is shown and measured in a series of progressive graphic displays.

# TRAINING IS JUST ONE WAY IVIS EXCELS ON THE JOB

An automotive manufacturer decides to switch from relay assembly lines to programmable controller networks. *How can that manufacturer train 8,000 electricians to do the new job quickly and reliably?*

A military branch has to teach new recruits a range of basic skills, from functional literacy to map reading, so they will be competent to safely operate a Chapparral missile carrier. *What is the fastest, most effective way of training them?*

These scenarios are examples of only one of IVIS's most distinctive capabilities: visually dramatizing lifelike situations. Simulation shows you exactly what to do by demonstrating just how it is done best.

Through anatomical simulations, medical students can learn to recognize symptoms and diagnose diseases by practicing indefinitely, without risk to life or limb. Simulation need not be dramatic to be effective as a training

technique or information tool. Mock-ups of sophisticated equipment can be constructed and disassembled, even "broken" and tested, once repairs have been made.

By affording the chance to play out consequences in a safe environment, both the electricians and the new recruits can use IVIS to master skills critical to meeting the new demands of their jobs.

## Consistent, Reliable, On-the-Job Training:

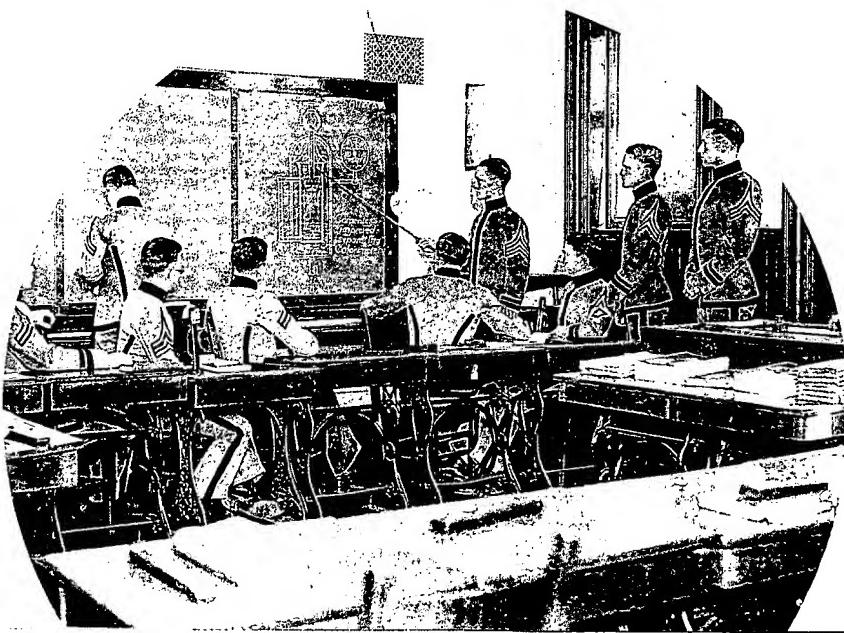
We don't have to tell you how important training and retraining are to your business...or how the cost grows higher every year. And how much greater is the cost of not training.

Consider the way you deal with your training needs today, and let us show you how IVIS could change that picture:

Let's say you have 200 employees at each of three facilities across the country, working around the clock

to produce a new product. Manufacturing changes must be adapted to industry standards of quality and workmanship without delay to maintain productivity, revision level control and profits.

Consider the costs and delays of travel, coordinating work schedules, time away from the job-at-hand, instructors' fees, insuring consistency of training and information, and compensating for turnover. *How quickly could your business respond to this challenge?*



Advances in training techniques have taken us a long way from the chalkboard days of this military academy. Because students retain 25% of what they hear, 45% of what they see and hear, and 70% of what they see, hear and practice, IVIS tackles the problem of making learning exciting, effective and enduring.

With IVIS, you virtually eliminate the cost of travel, the need for hiring any instructor and disrupting the normal work schedule. You could:

- visually simulate or diagram design changes
- highlight critical features with computer-generated graphics, animation, and/or text
- identify part numbers or procedures with text
- underscore the entire new process with narration

And IVIS responds to questions as any good teacher would by:

- explaining new material
- providing additional examples, when called for
- correcting mistakes
- offering feedback

By affording the chance for trial and error on line, IVIS lets you spot problems on the screen before they become problems on the job.

All employees—not to mention your production schedule—benefit by consistent, reliable information... whatever their location, shift or prior experience.

#### **IVIS Lets You Monitor Progress.**

While IVIS helps your employees do their work by simulating job conditions and familiarizing them with equipment or techniques they haven't necessarily used, it can also give your management a good idea of their progress. Keeping administrative records for each IVIS viewer can assist in pointing out areas that deserve attention before they affect progress on the job.



# IVIS WORKS FOR US. WE CAN HELP IT WORK FOR YOU.

With our own long history of experience in systems-based education and proven success with IVIS as a training tool, we can help ensure that critical skill levels, taught on the job, meet your expectations. And we can show you how smoothly and cost-effectively you can use IVIS to assure consistent, high-quality training throughout your organization.

## Digital's commitment to education:

At Digital, the value of training is much more than a principle. The Educational Services group we started twenty years ago now numbers more than 1900 instructional professionals, who develop courses and teach customers and our own employees at Digital training centers around the globe.

### Ten reasons why IVIS gets the job well done:

- offers "hands-on" experience, "one-to-one"
- teaches complicated skills without complications
- increases motivation and retention by stimulating, independent learning
- assures consistent quality of training over widespread locations
- requires less supervision and time away from the job
- each user receives the best presentation of course content at his or her own pace and schedule
- employees can pinpoint the exact piece of information they need by random access
- accommodates updates and changes in content
- allows a wide range of media and teaching techniques to be flexibly mixed
- workers learn new skills in less time at less cost



The pressure-sensitive DECtouch screen, an IVIS option, allows the viewer to communicate with the computer without words, control commands or even a keyboard. By simply touching a point on the monitor screen, the computer instantly responds.

## Count on Digital for the total picture.

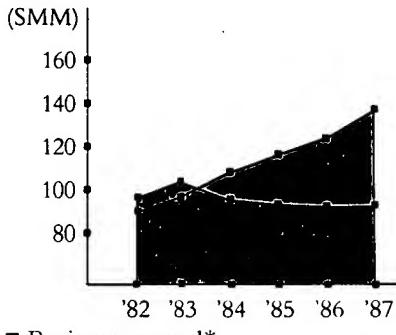
Along with IVIS's delivery capabilities and the VAX PRODUCER's flexibility as a software development tool, Digital offers a library of generic IVIS courses as well as a host of courseware development and consultation services to help you adapt IVIS to your organization's needs... quickly, smoothly and economically.

### And we speak from experience.

IVIS began three years ago in an effort to improve Digital Field Service training. With 400 service centers around the world, we needed to streamline and standardize our operations to ensure keeping our technicians up-to-speed with new products, and to decentralize training to reduce the forbidding travel costs that accounted for over half our total training budget.

### Field Service Example

#### Projected Customer Benefits:



- Business as usual\*
- Plan for the 80's

\*Cost of Training, Tuition, Travel,  
Per Diem, Salaries

### Our own IVIS success story:

The acid test was an interactive IVIS pilot course, adapted for the repair and maintenance of our LA100 printer. We measured its success against an equivalent non-interactive audiovisual lecture/lab that was twice as long. IVIS passed with flying colors, with course completion times 23 to 46 percent better than those of our control group. Our experience confirmed not only IVIS's potential to dramatically increase our technician's learning speed and recall over previous training methods, it convinced us to adapt IVIS across the board to our Field Service training. We project this measure will save us some fifty million dollars over the next five years.

### Courseware is the key.

Quality courseware is the key to making IVIS and other systems-based education technologies work best for you. Whatever your training or information needs, Digital now offers the benefit of our own experience and expertise in a wide range of consulting and custom courseware development services, designed to meet your particular needs.

Our staff of professionals will work with you to identify information needs in your organization and advise you on the most effective way to adopt a systems-based approach to resolve those needs. By helping you gain the knowledge and skills to capitalize on the creative solutions IVIS offers, we can help you to see significant returns that continue to grow over time.

### Quality and service you can rely on.

While IVIS is new to the Digital family, you probably know well the quality and service that have made our reputation as an industry leader for the past twenty-five years. We stand behind all our products with a full complement of support, including hundreds of Field Service Centers around the world, on-call service and a toll-free hot line for any questions we can answer for you.



Central Park

Central Park is a public pleasure ground in New York City. It comprises 840 acres, of which 147 are lakes. The general plan of the park was designed by Frederick Law Olmsted and Calvert Vaux in 1857. The park is two and a half miles long and a half mile wide, stretching from 59th to 110th Street. There are 26 bridges, 1,500 trees, thirty-five miles of walks, and five and a half miles of bridle paths.

Central Park is the heartland of New York's public parks. In a recent year the park was visited by over 8,150,000 people, of whom 3,150,000 were children.

This computer-generated graphic of Central Park against the Manhattan skyline illustrates the wealth of information that can be stored and recalled by IVIS in a matter of seconds.

## IVIS: An Idea Whose Time Has Come.

No one would argue that the future of industry depends on effective communication. Today, the most advanced computer systems on the market make use of text, graphics and database access capabilities. IVIS is the first to add the dynamic sensory stimulation of sight, sound and touch to the list, in addition to access to other software programs.

Interactive communications has the potential to change the face of information exchange throughout the world. Innovators in industry, government and professional organizations have just started to see the dramatic results the initiative can deliver.

The following are some examples of the uses to which interactive programs have been applied. And your imagination is the only limit.

### Industry:

- automobile sales and repair
- banking and insurance records
- computer maintenance and repair
- electronics training
- management training
- packaging productivity
- point-of-sales information
- real estate sales
- robotics maintenance

### Government/Military:

- aeronautics
- computer programming
- microelectronics
- missile battery maintenance
- radar command system repair
- social welfare worker training
- tank gunnery training
- water/wastewater plant operations

### Medicine:

- artificial respiration and CPR training
- clinical reference slides
- surgical procedures
- medical records administration

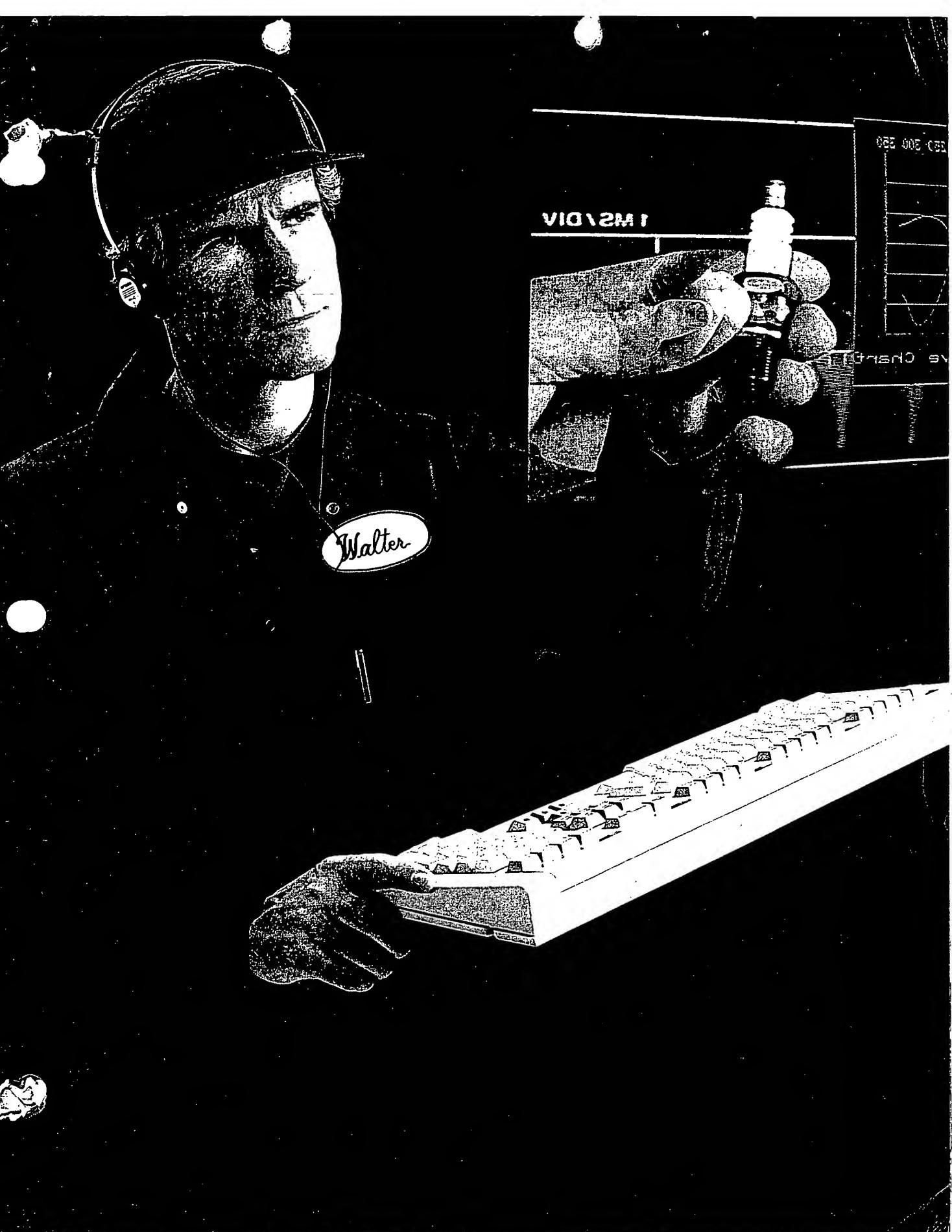
So whether you need to streamline manufacturing process control, catalogue volume retail orders, store archival data, or communicate via electronic networks, consider IVIS for the total picture: getting more work done in less time at less cost. See what IVIS can do to help you prepare for tomorrow's training today. For more information, please return the enclosed business reply card, or call your local Digital sales representative.



For cataloguing volume retail information, IVIS is an incomparable time-saver. Detailed orders can be placed and monitored at the touch of a fingertip, with the IVIS Videodisc Touch System.

IVIS, Professional 350 and VAX are trademarks of Digital Equipment Corporation.

© Copyright 1984. Digital Equipment Corporation. All rights reserved.





digital™



**How to find  
the pot of gold  
at the end of  
this rainbow.**

Order the kit that puts you in the forefront  
of the two-way video breakthrough.

Producing Interactive  
**Videodiscs**

Scotch®

**Videodisc**

**Videodisc**

Scotch®  
**Videodisc**

Side  
1

Side  
1

Producing Interactive Videodiscs  
Optical Recording/3M  
All Rights Reserved

## The two-way video breakthrough is Interactive Scotch® Videodisc.

Video that not only lets the audience respond to the programmed material, but also lets the programmed material respond to the needs and desires of the audience.

Chances are, the potential of interactive videodisc is no secret to you.

If you're a video producer or post-production specialist, it can open up whole new markets for your talents.

If you're responsible for an in-house video production facility, it can mean a new level of efficiency and economy in your sales, training, and communications programs. And in archival storage and retrieval.

If you're a consultant in video, training or communications, you can use interactive videodiscs to help satisfy your clients' needs.

This is the potential of the interactive videodisc.

### **Now you can begin to tap the potential of this new medium.**

Because 3M — the company that pioneered the first video tape more than 25 years ago — is now a leader in bringing you the interactive laser videodisc.

3M plans to concentrate its effort on manufacturing the videodisc itself. But to help you produce interactive programs suitable for laser disc, we've prepared a production training kit that includes a two-sided Scotch videodisc and a 75-page manual. Together, the manual and disc describe and demonstrate

considerations for videodisc program design and production. Also included is a free copy of a detailed and fully illustrated manual on videodisc premastering/post production.

Use the kit as a reference library for describing disc capabilities to customers, as a tool to sell the videodisc concept, as a self-contained training program and a ready reference source for employees suddenly involved in videodisc production.

Compare the cost and convenience of this production kit with the time and money you'd have to spend to send employees to a training workshop. With our production kit, you can provide a high caliber of training — while keeping your information resources close at hand for future reference.

"Producing Interactive Videodiscs" uses a disc to demonstrate the production of interactive videodiscs. In other words, the medium really is the message!

The instructional program is divided into six main sections that together enable the experienced video producer to confidently and competently undertake production of interactive videodisc programs.

### **Tune in to this program — and tune in to the future.**

Section I answers the question, "What is a Videodisc and What Does it Do?" It explains the capabilities of videodisc hardware and implications for videodisc producers. You'll become familiar with the three levels of interactivity. And you'll be presented with

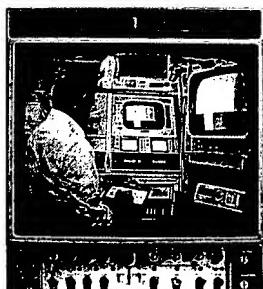
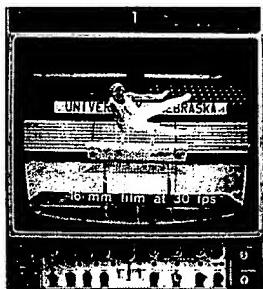


key cost considerations in video-disc production.

In Section II, "Authoring the Videodisc Program," you'll

learn about the team approach to authoring and the steps involved in instructional design. And you'll get the opportunity to interact with the program yourself, taking part in demonstrations of varying degrees of complexity.

You'll start getting into the mechanics of production in Section III, which details "Legibility and Field/Frame Relationships"—including the legibility of different character-generated fonts. Section IV takes you through the steps of "Producing Motion Sequences." A visual appendix to this section shows you how to deal with freeze frame flicker. This appendix also compares the results of producing original source material on  $\frac{1}{2}$ -inch,  $\frac{3}{4}$ -inch, and 1-inch videotape, as well as 16mm film. In Section V, you'll become acquainted with "Producing Still Frame Materials and Premastering." And specifications for "Mastering and Replication" are detailed in Section VI.



The manual is completely indexed and includes an extensive bibliography. In addition, a glossary is provided in the manual and on each side of the disc. The disc program also contains tests and answers at the end of each chapter.

Considering the benefit you can realize from this new technology, your purchase of our production kit is a wise investment indeed. It's a sales tool to use with your customers, a training tool for your employees, and an invaluable reference for yourself.

To order "Producing Interactive Videodiscs," send your payment and the attached order form in an envelope. If the order form has been removed, you can receive another by writing to the following address: Sales Coordinator, Optical Recording Project/3M, 223-5S 3M Center, St. Paul, MN 55144.

Remember, the two-way video breakthrough is happening now. Now is the time to make it start happening for you.

M-OR-PIVSB(43.8)NPI

"Litho in USA with 3M offset plates, film and proofing systems."

**Optical Recording Project/3M**  
223-5S 3M Center  
St. Paul MN 55144

**3M**

A

3M

# THE DYNAMICS OF INTERACTION.

"I don't  
understand."

"It's starting  
to make some  
sense."

"Now I  
understand."

# THE DYNAMICS OF INTERACTIVE SCOTCH® LASER VIDEODISC.

## **Two-way communication.**

In training and education, business-to-business presentations, point-of-purchase sales, electronic publishing, arcade video games, archival storage, and a variety of other applications, Scotch® Laser Videodisc involves the audience like no other medium. The user controls and interacts with the presentation for programmed learning, responding with a remote-control keypad or light pen, or simply by touching the screen. With a built-in microprocessor, industrial videodisc players react to viewer responses by accessing a computer program recorded on the laser videodisc. When an external computer is interfaced with the player, elaborate "branching" sequences are possible without encoding programming information on the disc.

## **Superb programming flexibility.**

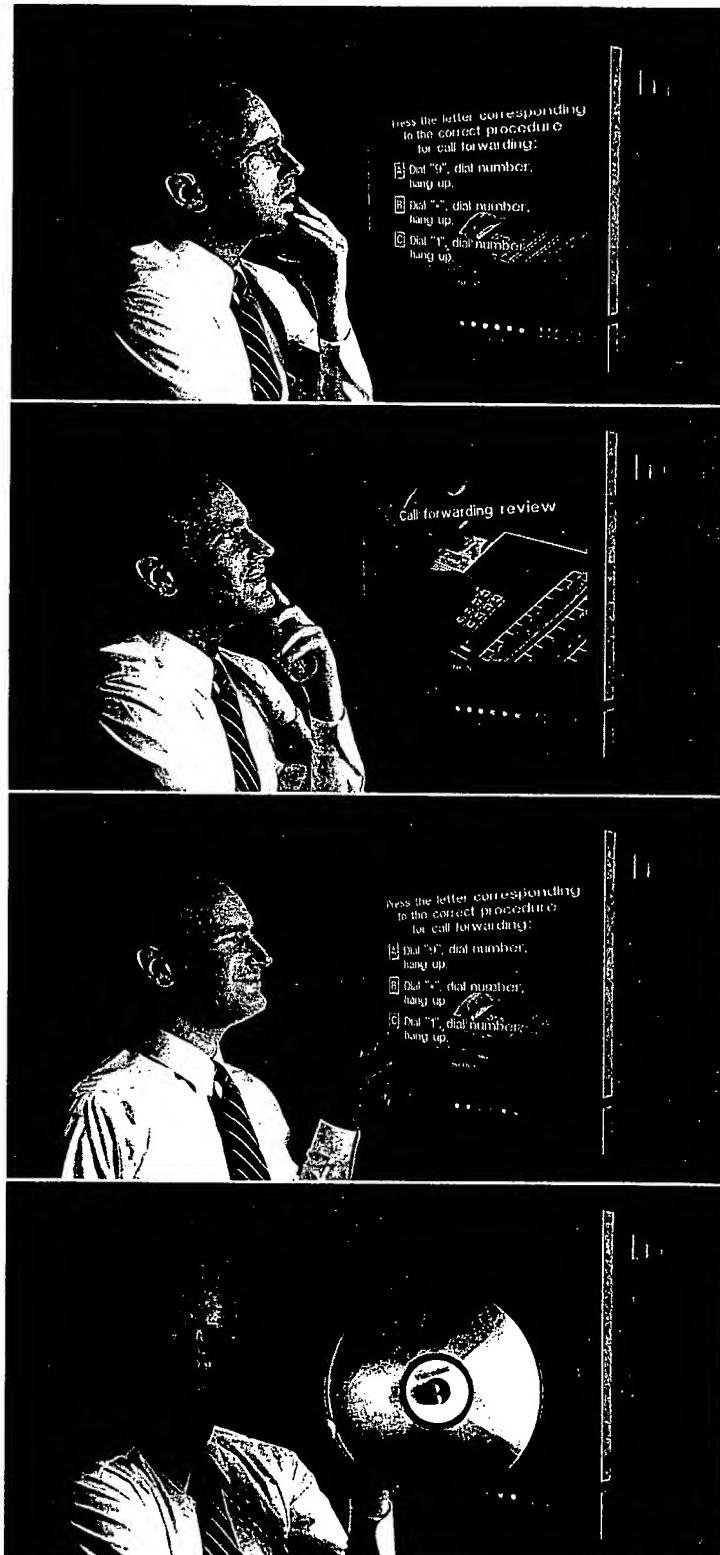
With the player's random-access capability and the radial arrangement of information on the disc, the presentation can be programmed to give the viewer immediate feedback. Within a few seconds, the videodisc player can access any of the 54,000 frames on a single side of a 12-inch disc. Based on viewer response, presentations can be programmed to review sessions automatically. The viewer can also review material manually, scanning the frames as if flipping through pages of a book. Source material can come from whatever form best contributes to the communication. Slides, film, and videotape can all be converted to a premaster videotape. Once the disc has been replicated, all source material will be projected with vivid clarity.

## **Hands-on participation.**

After obtaining a firm grasp of the material, the viewer can make the correct responses and proceed with confidence. The nature of the presentation demands undivided attention, turning passive observers into active participants. As a result of this "hands-on" participation in the communications process, the viewer can be expected to demonstrate superior comprehension and retention of the material. The videodisc system's freeze-frame and slow-motion capabilities help to simplify complicated information. Interactive videodisc is equally effective whether the communication objective is to teach, persuade, or entertain. Whatever the application, this medium offers an entirely new dimension of viewer involvement.

## **Built-in advantages.**

Information on the disc is protected by a layer of plastic and read back by a laser beam. This non-contact technology means there is no measurable disc wear. The brilliant picture quality is unaffected by normal scratches, dust, or fingerprints. Stereo sound can be projected with extremely high fidelity for thousands of hours of play. Dual-channel audio can be used to gear a presentation to the viewer's understanding. Each channel, for example, could contain a different language or narratives with different levels of complexity. The advantages built into interactive videodisc make its potential practically limitless. The pages that follow describe a variety of successful applications that have begun to tap that potential.



# HOW CORPORATIONS AND INSTITUTIONS ARE USING VIDEODISCS.

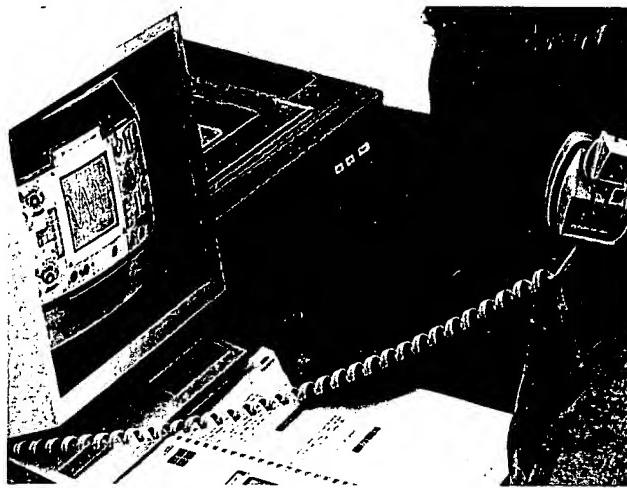
Descriptions of actual applications may spark some bright ideas of your own. Ideas that will result in higher levels of audience involvement.

## Involvement in training.

RAYTHEON COMPANY, manufacturer of various electronic systems, also develops — through its service subsidiary — interactive videodisc programs for employee training on various types of sophisticated hardware. Raytheon utilizes the touch-sensitive screen and the powerful technique of two-dimensional simulation in the design of their videodisc training systems.

The trainee can become proficient in the use of intricate equipment by participating in the practice sessions, which are literally "hands-on" experience. Performance records are provided to track each trainee's progress.

NATIONAL EDUCATION CORPORATION'S ICS-INTEXT Division, an industrial vocational training company, uses 3M videodiscs in combination with bar code



National Education Corporation combines videodisc with bar code technology for training.

technology (similar to those used at supermarket check-outs). The use of bar code technology eliminates the need for a keyboard, so no typing skills are required. Trainees in the ActionCode™ Electronics Technology program use a scanning wand to scan bar codes in their workbooks. This procedure automatically accesses the desired section of the videodisc program.

Trainees can call up a sequence of an oscillo-

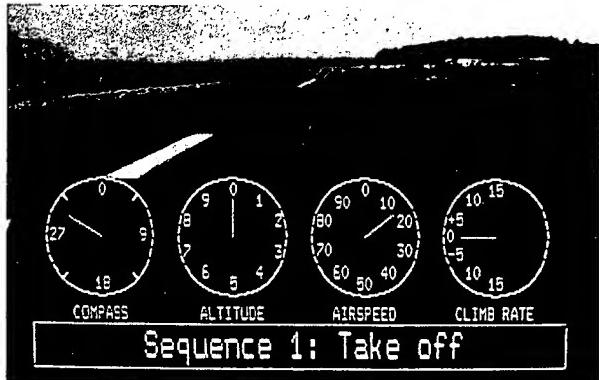
scope on screen, for example, then answer questions about specific controls on the machine by touching the screen in the appropriate place.

DIGITAL EQUIPMENT CORPORATION has developed a new Interactive Videodisc Information System, called IVIS™ using Interactive Scotch® Laser Videodiscs.

Digital's IVIS is a computer-controlled video-disc system used to train field service personnel. Part of the system is Digital's VAX™ Producer which allows users to create their own videodisc programs.

Based on their internal success with IVIS, Digital is now marketing the system to other firms.

Digital Equipment Corporation's IVIS™ courseware combines graphics with live-action footage for realistic simulation of training situations.



## Involvement in education.

Exciting opportunities for interactive videodisc as an educational tool are demonstrated by the NORTH AMERICAN PHILIPS CORPORATION disc, *Van Gogh Revisited*. Source material for the disc includes slides of Van Gogh paintings reproduced in faithful color, plus text and narration. But the most remarkable aspect of the disc is the variety of ways it can be viewed and heard. There are three viewing modes, so the student can choose to see anything from a smattering of the painter's work to a scholarly reference section.

Using the system's dual-channel audio capability, the program also offers a choice between a critical narration and a recitation of letters written by Van Gogh. Although originally created as a Level One program, the brilliant still-frame art of Van Gogh has encouraged program designers to adapt the disc for Level Three uses.

Another facet of interactive videodisc's value as an educational tool is found on the Space Disc™ series produced by VIDEO VISION ASSOCIATES. Developed by The Center for Aerospace Education at Drew University in cooperation with NASA, these discs combine

videotape footage, film, and slides to provide educators with a permanent record of historic space explorations such as the Voyager and Apollo missions.



*Educational discs produced in cooperation with NASA make use of videotape footage, film, and slides.*

A more recent series of discs, the *Space Shuttle Mission Reports*, capture the drama and excitement of the space shuttles. A new *Space Archive™* series of discs is being produced for home video viewers. Space Archive currently offers discs on the dramatic space shuttle missions and the last manned landing on the moon.

#### **Involvement in retailing.**

CUISINARTS® has developed a highly effective point-of-purchase sales presentation for their food processor using interactive videodiscs. A special videodisc player console is set up in-store. By

pressing the appropriate button on the console, shoppers can call up the particular Cuisinart® facts or features that interest them. Using this system, one major department store doubled its Cuisinart sales in a single year.

Similar point-of-purchase videodisc programs are being created by J.P. STEVENS and by production companies such as NUVATEC and BYVIDEO. Housed in kiosks, these programs are being marketed to shopping malls and retail stores.

The COMSELL REALTY SHOWCASE disc allows prospective home buyers to search through thousands of homes at the touch of a button.

VCM SYSTEMS, INC.; PEDERSEN ASSOCIATES; INTERMEDIA, INC.; CREATIVISION; DIGITAL CONTROLS, INC.; SIMUFLIGHT, INC.; and RETAILERS POINT-OF-PURCHASE NETWORK, INC. all have created interactive



*Comsell's Realty Showcase helps viewers find the home of their dreams.*

videodisc programs designed to educate and sell prospective purchasers of computer hardware and software. Computer retailers use these programs not only to sell customers at the point of purchase, but also to train their employees in selling the merchandise. The complexity of computers and the large variety of products available make them an ideal subject for retail videodisc presentations.

#### **Involvement in sales presentations.**

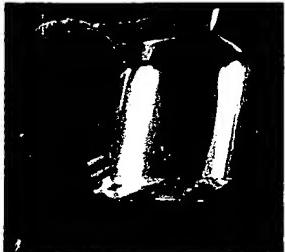
The same factors that make videodisc such a potent sales tool at the point of purchase are at work during industrial or business-to-business sales presentations. It is particularly useful in selling products or services which ordinarily are difficult to demonstrate.

An example is Scotchlite® Brand Reflective Sheeting (High Intensity Grade), manufactured by 3M's TRAFFIC CONTROL MATERIALS Division and used for street/highway signing. Sign brightness and visibility at night are affected by such driving conditions as the amount of ambient light surrounding the sign, and the age and eyesight of the driver. These variables can be simulated using a device called the Otto Mohr Simulator. However, the simulator is a bulky, intricate piece of equipment, impractical to transport around the country for demonstrations.

By recording the full range of responses to the simulator on a videodisc, 3M is able to have viewers participate in simulations that put them in the driver's seat. They press a button when they can see a sign clearly, then are shown what their performance would mean if they actually had been driving on a highway and reacting to conditions like those simulated.



*Cuisinart® display shows shoppers just what they want to know about the product.*



Videodisc brings animation and live action to arcade games.

#### **Involvement in entertainment.**

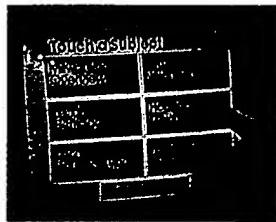
Interactive laser videodisc is now establishing itself as the medium which makes possible the ultimate in video arcade games. These disc-based games do something that conventional arcade games never could: present animation or live-action films in which characters "react" to the players' responses. *Cliff Hanger* by STERN is an animated game in which electronic graphics evaluate the players' performance between plays, even suggesting what they might have done differently. ATARI'S *Fire-fox V* uses a combination of animation

and live action. WILLIAMS ELECTRIC, VIDEOGRAPHIC PUBLISHING, and other firms have also produced video games using Interactive Scotch® Laser Videodiscs.

#### **Involvement in public information.**

THE CITY OF MILWAUKEE is pioneering the use of touch-screen interactive video as a means of disseminating public information. The disc is called *Discover Milwaukee*, and it enables viewers to do just that.

Set up in an information center at The Grand Avenue Mall in downtown Milwaukee, the presentation informs viewers of Milwaukee housing opportunities, neighborhoods, history, and housing laws. The computer-linked random-access capability



*City of Milwaukee presentation gives viewers a choice of topics.*

of the disc allows viewers to take their own customized "tour" of the city.

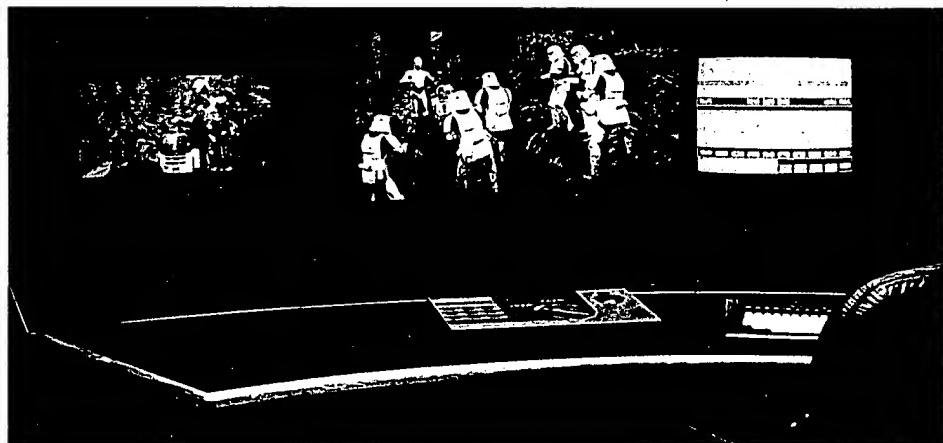
#### **Involvement is the common denominator.**

The applications for interactive videodisc are so varied that videodisc program producers are able to carve out their own lucrative niches. Some producers have concentrated their efforts in specialized fields.

For example, LUCASFILM, LTD. and CONVERGENCE CORPORATION are finding entirely new uses for interactive videodisc. The companies are marketing an advanced system for film and video editing called EDITDROID™.

Despite the diversity of interactive videodisc applications, the underlying principle is always the same: the viewer can interact with the programmed material. It can be as elementary as pushing a button to scan data. Or as complex as simulating technical procedures on equipment interfaced with a disc by computer.

Interaction means involvement. Involvement means successful communications. These are the dynamics of Interactive Scotch® Laser Videodisc.



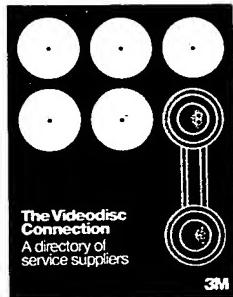
An unusual application of Interactive Scotch® Laser Videodiscs is in an advanced film and video editing system called EDITDROID™ developed and marketed by Lucasfilm, Ltd. and Convergence Corporation.

## HOW 3M CAN MAKE VIDEODISCS WORK FOR YOU.

As the leader in quality interactive laser videodisc mastering and replication, 3M has the resources and know-how to help you get off on the right foot as you venture into videodisc production.

### Rely on 3M's production training kit to learn the basics.

Entitled *Producing Interactive Videodiscs*, this kit includes a two-sided Scotch® Laser Videodisc and a 75-page manual. Together, the manual and disc describe and demonstrate fundamentals of videodisc program design and production. The kit is invaluable for video producers, post-production facilities, and video/training/communications consultants.



### Use 3M's supplier directory.

3M's directory, *The Videodisc Connection*, is a compilation by region and state of interactive laser videodisc vendors in each of eight categories: interactive videodisc design/authoring, video production, premastering/post-production, videodisc program simulation/evaluation, computer programming, system design/configuration, custom packaging, and premastering services for data storage.

### Trust 3M to provide the finest quality discs in the shortest possible time.

If 3M receives a master tape by 8:30 a.m. on a working day and approves it, up to 10 one-sided laser

videodiscs can be shipped out that same day. Following tape check-in and approval, 3M also offers one-day turnaround on orders of up to 50, and three-day turnaround on orders of up to 150. These expedited services require as little as two-week advance notice for scheduling, packaging preparation (three to six weeks for special packaging), and credit approval (two to six weeks). We can offer the same quick turnaround whether your master tape is 1" type C or  $\frac{3}{4}$ " professional tape, produced to 3M specifications.

### Call or write today.

To receive more information on our production training kit, a free copy of our directory of videodisc service suppliers, more facts on 3M disc mastering/replication services, or the name of the 3M representative in your area, write:

Optical Recording Project  
3M Center/223-5S  
St. Paul, MN 55144

Or phone 1-800-328-1300  
ext. 3-2142.

In Minnesota, call collect:  
(612)733-4435.  
And start putting the dynamics of Interactive Scotch® Laser Videodisc to work for you.



3M can ship Interactive Scotch® Laser Videodiscs the same day after approval of the master tape.

## SCOTCH<sup>®</sup> VIDEODISC DETAILS.

**Size:** 12 in. diameter by 0.1 in. thick (30.5 cm by 0.25 cm).

**Weight:** 7.4 oz. (210 g).

**TV standard:** NTSC standard 525-line 60 Hz format.

**Formats:** Constant Angular Velocity (CAV) allows up to 30 minutes per side of straight play or 54,000 single frames. Permits interactive use.

Extended play format (Constant Linear Velocity or CLV) allows up to 60 minutes per side of straight play, but with limited interactive capability. Random access and freeze framing are eliminated.

**Audio:** Stereo, monaural or dual-independent. Wide band signal/noise is better than 58dB and weighted signal/noise is better than 63dB. Noise reduction systems are available. Details will be provided on request.

**Program master tape:** 1" type C composite NTSC 525-line 60 Hz or  $\frac{3}{4}$ " professional videotape.

Write 3M for details on premastering specifications and suitability of other original-source materials.

**Labeling and packaging:** Generic or custom packaging is available. Details will be provided on request.

**Levels of system interaction:** The videodisc can be used in a range of systems offering varying levels of interactivity:

*Basic Level* plays video information in a linear sequence, in either the CAV or CLV format.

*Level One* uses a linear video recording that can have both chapter stops and automatic picture stops. The viewer controls interaction through the control panel on the player or the keypad. The viewer can go directly to any chapter or frame desired and can manually command step motion, freeze framing, forward and reverse play, scanning, and fast play or slow motion.

*Level Two* interaction is made possible through the use of an industrial player with built-in microprocessor. Prewritten computer pro-

grams can be entered into the player's memory manually (through the keypad) with each use, or during mastering, by recording the program on the disc in audio channel two. This is called a "digital dump". The player's memory is programmed so that the video sequence and play mode are predetermined. Viewer responses cause automatic branching to the appropriate video sequence.

*Level Three* systems control the videodisc program by interfacing the player with an external computer. This offers great program flexibility and potential. Because computers have large memory capacities, complex programs can be designed (and changed) for a wide range of applications. The computer can be programmed to log user responses for evaluation of test scores. Computer graphics can be overlaid on the video content. A wide range of devices such as light pens, paddles, joy sticks, touch-screens, etc., can be interfaced to accept viewer response.



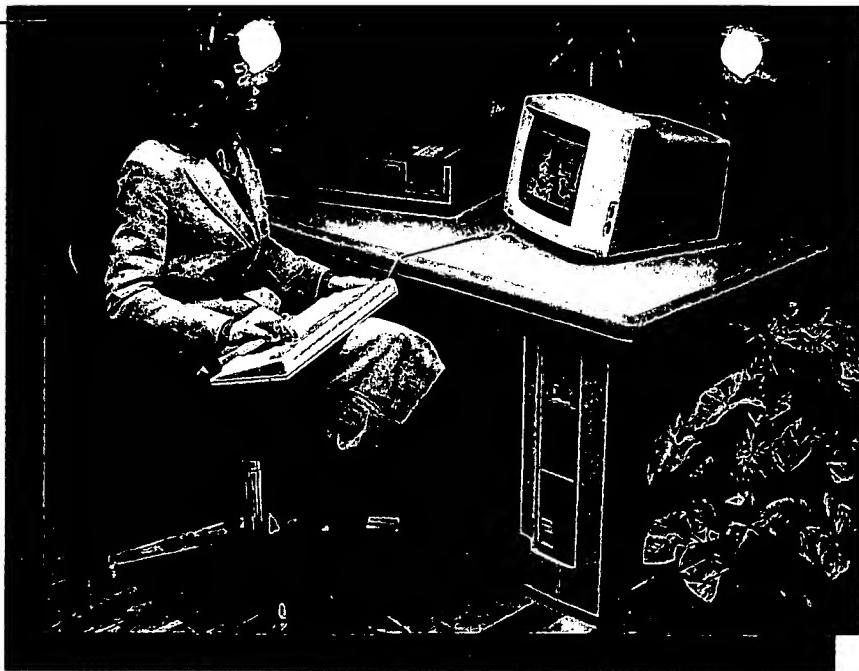
M-OR-VG5B (842) JR  
Litho in USA with 3M offset plates, film and proofing systems.  
© 1984 Minnesota Mining and Mfg. Co.

3M hears you...

Optical Recording Project/3M

223-5S 3M Center  
St. Paul, MN 55144

**3M**



## DIGITAL CONSULTING & CUSTOM COURSEWARE DEVELOPMENT SERVICES

Effective courseware is the key to using IVIS and other systems-based education (SBE) technologies to solve large-scale training and communications problems. To decentralize and standardize training, integrate that training with on-the-job performance, and ensure that critical skill levels match performance expectations, carefully planned systems-based education results in a significant reduction in training costs. Based on a figure of 2000 students per year, estimates of cost per student hour are 25 percent less with SBE. In addition, travel expenses (that account for 60 percent of the average total training budget) are eliminated.

Digital now offers a full range of consulting and custom courseware development services to help you make the best use of interactive technology. Our staff of Educational Services professionals will advise you on the most effective and economical way to adopt a systems-based education approach to your organization's training and communication needs. With our long history of experience in systems-based education and success with IVIS as an internal training tool, we can provide you with the benefit of our experience and expertise.



## Digital's Consulting Services

Digital offers two kinds of educational consulting services to provide your organization with the knowledge and skills fundamental to utilizing IVIS and other interactive technologies to best advantage:

### 1. Planning Services

Digital assists in making key business decisions critical to implementing an SBE approach to training or information needs. This includes consulting on economic, technical, and operational feasibility of proposed large-scale projects.

### 2. Design Services

Digital advises on the design, development, implementation and maintenance of large-scale projects, including:

- Detailed needs analysis
- Preliminary design studies
- Selection of appropriate educational technology and methodology
- Matching of appropriate media to educational delivery requirements
- Providing programming, visual design, video production and project management expertise, to supplement customer resources

## Digital's Custom Courseware Development Services

Digital offers four categories of service which provide for the design, development, implementation and maintenance of custom courseware.

### Complete Turnkey Solutions

Digital provides all services and resources required to develop custom courseware. In most cases, subject matter expertise will be the responsibility of the customer.

### Collaborative Effort

Digital pools resources with your organization. The result is that you gain experience using IVIS tools to produce courseware, and assume direct responsibility for the final product.

### Courseware Warranty Services

Digital provides ongoing support to help you maintain and update custom courseware developed under either of the above alternatives.

### SBE Training

Digital's Educational Services will offer a range of courses for IVIS and other delivery systems early next year. Tailored on-site training is currently available on request.

## The Courseware Development Process

The parameters of the custom courseware development process will depend on the type of service required, the length of the project, and the variety of media necessary to solve a given training problem. This process typically begins with a pilot course, with an estimated time frame of six to eight months, from contractual agreement to course delivery.

The courseware development process involves:

- Identification and definition of the problem
- Development of goals with subject matter experts
- Instructional design and development of course materials
- Computer-generated graphics design and production
- Interactivity design and production
- Audiovisual media production
- Integration of course components
- Course testing and delivery

IVIS and other systems-based education solutions can offer organizations significant cost reductions. Based on a figure of 2000 students per year, it is estimated that the cost per student hour can be reduced by 25 percent—from \$26 per student hour for a standard lecture/lab to less than \$20 for IVIS training. In addition, the cost of travel, hotel and per diem (expenses that account for 60 percent of the average total training budget) are eliminated.

Costs for developing custom courseware vary from application to application. The fact that Digital products feature an exceptional degree of interactivity and can be precisely tailored to meet specific training needs ensures the fastest possible learning path for the learner.

## Digital Custom Courseware Development Services

Digital Educational Services offers rates competitive with standard U.S. rates for interactive videodisc custom courseware, between \$50,000 and \$100,000 per completed course hour.

### Availability

In the U.S., Digital offers Consulting and Custom Courseware Development Services in Bedford, Massachusetts. For large, multinational organizations abroad, Digital provides the full range of SBE services from the following locations:

- Reading, England
- Evry, France
- Munich, Germany
- Nieuwegein, Holland
- Tokyo, Japan

### Support Services

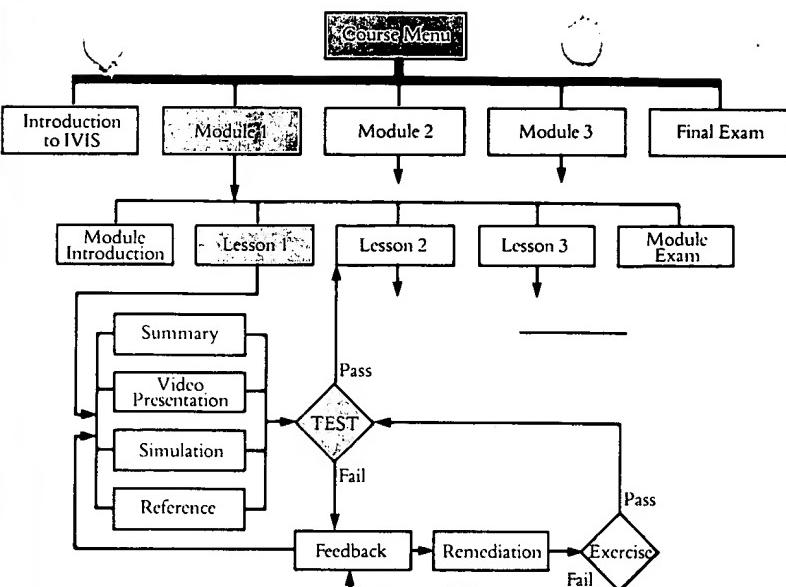
For more information or technical support, contact your Digital Educational Services marketing representative.

**digital**™

IVIS and Professional 350 are trademarks of Digital Equipment Corporation.

Pioneer and Sony are trademarks of Sony Corporation of America and Pioneer Electronic Corporation.

© Copyright Digital Equipment Corporation 1984. All rights reserved.



IVIS Courses utilizing interactive combinations of video, audio and computer-generated text and graphics are easy to design with Digital's VAX PRODUCER authoring system.

The interactivity and branching of a course, shown in red, is created using VAX Design.

VAX Draw is used to display all of the visuals within a course, including menus, computer-generated graphics and calls to the interactive videodisc player.

## VAX PRODUCER

The VAX PRODUCER is Digital's powerful new software development system for creating interactive IVIS programs and courseware. Designed by interactive courseware developers for interactive courseware developers, the VAX PRODUCER is a proven authoring system, the culmination of years of Digital's own internal development and use.

The VAX PRODUCER is the most powerful and flexible development system on the market for interactive programs and courseware design. It contains all the software functionality necessary to create interactive programs and courses on a VAX/VMS development system, for delivery on either a VAX system or on a PRO IVIS/Learning Workstation.

As an authoring system, the VAX PRODUCER is unique in its ability to separate the process of creating the visuals (using VAX Draw) from the process of programming the logic, response-judging and branching (using VAX Design) that characterize interactivity. This "division of labor" facilitates a development team's productivity by allowing both programming and design independence, improving the quality of the final courseware.

The VAX PRODUCER has also been designed for system portability, so that instructions may be transported from a larger to a smaller system without architectural or address space problems. This flexibility offers system independence, especially for small systems, as well as terminal independence.



For the large-scale training and information needs of industry and government the VAX PRODUCER has been designed to allow the full and immediate adaptation of IVIS's capabilities in creating interactive programs or courses.

## Components

The VAX PRODUCER consists of the following major components:

■ VAX Design, Digital's new authoring language, used to create the branching and interactivity fundamental to an IVIS program or CBI course. A structured language with special features to support visually based, highly interactive programs, VAX Design also has the ability to call other programs from within a course. VAX Design is implemented by a Processor and Linker on a VAX/VMS system, and by an Interpreter on each target delivery system.

The VAX Design Preprocessor translates the source programs into pseudocode format, checking for correct syntax and all language-related consistency, and expands macros. The VAX Design Linker then takes the pseudocode file output and converts it into final form required by the Interpreter.

■ VAX Draw, Digital's graphics editor, is used to create IVIS screen displays, including computer generated color graphics, animated graphics sequences, text, menus, and IVIS calls to play back audio and video segments stored on the IVIS Videodisc Player.

■ VAX PRODUCER/Interpreter allows courseware programs created with VAX Design and Draw to also be executed on a VAX, using a VT52, VT100, VK100, VT125 terminal, with the Professional 350 acting as a dumb terminal. When used in conjunction with a PRO IVIS System, the VAX PRODUCER Interpreter can also issue commands to the IVIS hardware and linked videodisc player, and can also call other programs on the VAX system as directed by commands in the Interpreter's files.

■ The VAX PRODUCER CBI is a lively computer-based instruction program that teaches the basics of the VAX Design language and VAX Draw graphics editor, so that users can quickly begin to create simple lessons. Students can control their mastery of the learning material and progress through this two-day course at their own pace.

PRO/PRODUCER INTERPRETER allows courseware programs created with VAX Design and VAX Draw to be executed on a Professional 350. The PRODUCER Interpreter issues commands to the IVIS hardware and linked videodisc player, as stored in files produced with VAX Draw, and can also call other programs on the Professional 350 as directed by commands in the Interpreter's files.

## Specifications

VAX Design is the authoring language used to create the logic, response-judging, and branching for an interactive course. PASCAL-like in structure, VAX Design includes the following features:

- Variable type declaration, with arithmetic and logical operators
- Block structure, with hierarchical units and branching control expressions
- Retrieves display information from multiple VAX Draw form libraries and output text with attributes
- Special handling of input strings and errors, and processing of control and function keys
- Special constructs for menu-input controls, and commands to define windows for input collection and output feedback
- Ability to back up to various points in the program
- Chaining together of VAX PRODUCER programs
- Ability to run and exchange information with other programs

VAX Draw is a graphics editor that stores each picture in a record called a form, kept in a display library file. Draw forms define all the screen visuals in IVIS or CBI courseware. A single draw form can include any combination or multiple of visual effects listed below. VAX Design is the "thread" which leads the viewer from one draw form to another.

VAX Draw supports the VT52, VT100, VK100, VT125, Professional 350 and PRO IVIS/System terminals, and has the capability of handling:

- Text: characters may be positioned on the screen, centered, or displayed in boxes
- Graphics: arcs, circles, boxes, lines and curves can be generated\*
- Attributes: height, size, color, italics, blink, bold, reverse video, among many others are supported\*
- Animation: text and graphics may be animated on the monitor screen
- Menu: creates the menus controlled by the VAX PRODUCER Interpreter
- Conditional compilation: forms or pieces of forms can be compiled\*
- IVIS: (IVIS commands in Draw) controls the videodisc player(s) linked to a PRO IVIS/System, including video still-frame, "live" playback of video segments from any one frame on the disc to another, selectable audio between the two audio tracks, or both (mix), or neither, and selection of playback segments from either one or two linked videodisc players.

\*The use of these features is terminal dependent.

## Configuration information

The VAX PRODUCER can be used on any valid VAX/VMS system configuration with:

- 3700 blocks of permanent disk storage
- an additional 1000 blocks of disk storage for use during installation
- 1MB of physical memory
- For VAX 11/730 systems, an RA80/RL02 configuration is required

The VAX PRODUCER Interpreter can be used on any valid VAX/VMS configuration supporting standard VMS utilities. The following terminal types are supported: VT52, VT100, VK100, VT125, PRO-350 and PRO IVIS.

The PRO/PRODUCER Interpreter can be used on any valid Professional 350 system running P/OS Hard Disk Version 1.7. The extended bit-map option module and VR241 color monitor are required to support color graphics and text. The PC3VS-AA IVIS option and VDP40-AA videodisc player are required to support IVIS commands.

The VAX PRODUCER Media and Documentation includes binaries of the VAX Design Preprocessor and Linker, VAX Draw graphics editor, VAX Interpreter, VAX PRODUCER CBI, and full documentation.

The VAX PRODUCER Interpreter media and documentation includes a binary file of the VAX PRODUCER Interpreter and installation documentation.

## Licensing options

A license is required for each CPU. A Right-to-Copy license must be purchased for each additional CPU.

## Support services

The standard Software Product services, including Self-maintenance, Basic and DECservice support, are available for the VAX PRODUCER and VAX PRODUCER Interpreter. For service information, call your Digital software specialist.



**digital™**

IVIS, Professional 350, VAX and VAX/VMS  
are trademarks of Digital Equipment  
Corporation.

© Copyright Digital Equipment Corporation  
1984. All rights reserved.

EA-30278-80 1/84 23 50 VAX PRODUCER



## IVIS SYSTEM PACKAGES

### **Pro IVIS/Videodisc System and Pro IVIS/Videodisc Touch System**

Digital's new Interactive Video Information System, IVIS, combines the computing power of the Professional 350 with high-resolution video, dual-channel audio, sophisticated graphics and text in a versatile, dynamic Learning Workstation. IVIS's state-of-the-art information delivery system has the potential for changing the picture of large-scale training and a host of information needs, economically and effectively.

### **Quality Color, Resolution and Responsiveness**

IVIS presents moving and still video images of high quality color and resolution, along with computer-generated graphics and text, accompanied by dual-channel high-fidelity sound, played through headsets or amplified speakers. Viewers interact with material presented in IVIS programs through the use of the Professional 350 keyboard or DECtouch's pressure-sensitive screen. They can ask or answer questions, insert comments, review material or scan ahead, freeze frames for closer inspection—in short, get all the benefits of "live" teaching on the job, at their own pace, on their own schedule.

### **Digital's Development of IVIS**

IVIS was initially developed to train our own Field Service technicians, and our experience confirmed the dramatic difference IVIS makes in learning and retention: Dynamic sensory impact involves students in lesson material the way no previous teaching method can.



# IVIS Elements

## Video

The IVIS computer display is a 13" RGB (red, green, blue) monitor that uses three electron guns to "paint" primary color information on a cathode ray tube. Since television monitors use only one, the video images converted from NTSC (National Television Standard Signal Code) to RGB are superior to those of standard broadcast quality. Input from a choice of two external video sources - videodisc or broadcast quality videotape, video camera, cable or broadcast tuners - can be displayed on the RGB monitor.

## Audio

Two available audio channels can be used singly, alternately, in stereo or as four monophonic channels. Students can listen with either a pair of low-wattage speakers or headsets, to avoid disturbing others close by. Depending on the lesson material, the audio might consist of any combination of narration, dialogue, translation, special sound effects or music.

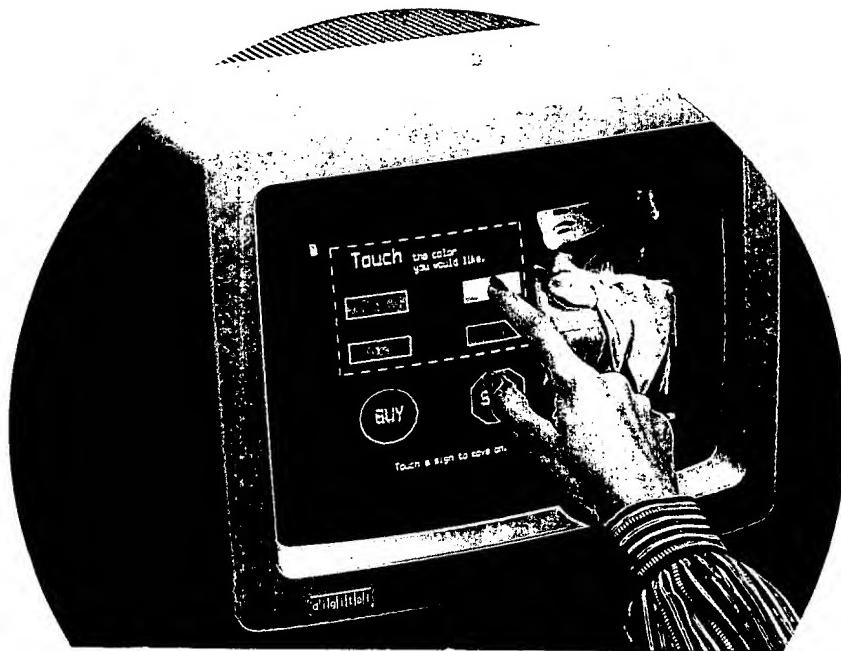
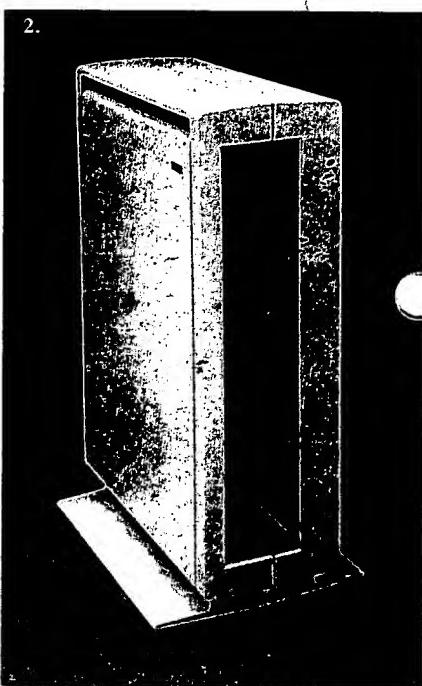
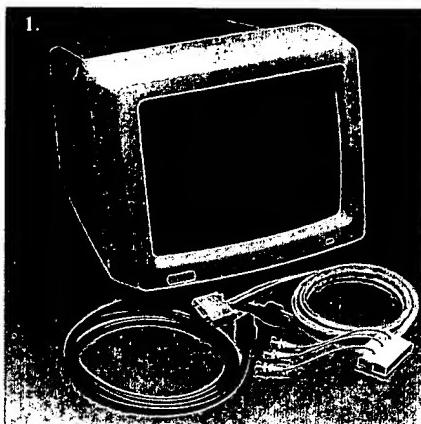
## Text and Graphics

Bit-map text and graphics can be overlaid on both dynamic and still-frame video images or displayed alone on the IVIS monitor. The high resolution of bit-mapped text and graphics can be further enhanced and distinguished from the underlying image by applying drop shadows of widths varying from one to fifteen pixels.

Virtually any type of graph, tabulation, label, geometric shape and pictorial overlay can be created on IVIS, in any combination of eight colors from a palette of 256 hues.

## IVIS Components

Operating in conjunction with Digital's Professional 350 personal computer, IVIS includes an analog box that houses two modules that interface with the external video sources. An extended bit-map module, a bit-map single plane video module, and the IVIS system module are inserted into the Pro's option module cage. Also included is a universal power control, requisite cables, and a software device driver which controls the video modes and transmits commands to the video sources.



The pressure-sensitive DECtouch screen, an IVIS option, allows the viewer to communicate with the computer without words, control commands or even a keyboard. By simply touching a point on the monitor screen, the computer instantly responds.

## VDP40 Laser Videodisc Player

The VDP40 Laser Videodisc Player\*, now available with both IVIS System Packages, produces clear, sharp, stable pictures of excellent color quality, and provides for separate bilingual or specialized soundtracks via two audio channels. The VDP40 is a modified version of the microprocessor-controlled Sony® LDP-1000A Videodisc Player that can play any standard constant angular velocity (CAV) optical videodisc.

CAV laser videodiscs have a storage capacity of 54,000 frames, or 30 minutes of real-time video, per side, and any point on a disc can be accessed by the VDP40 in a matter of five seconds.

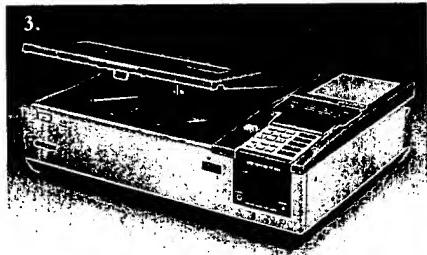
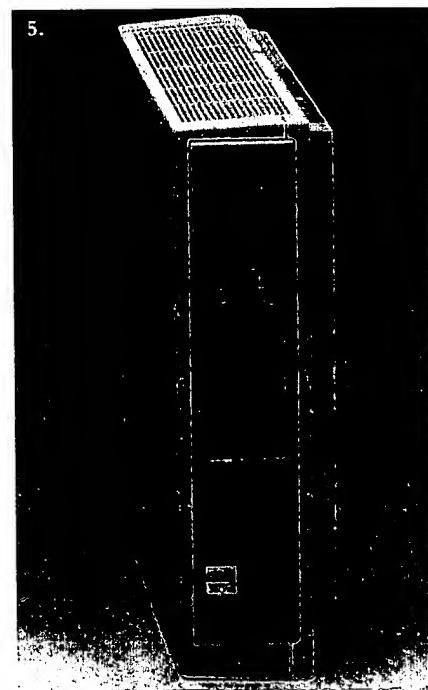
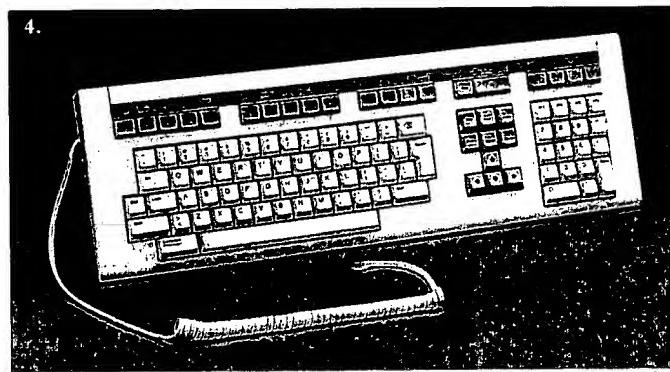
Variable playback modes allow you to proceed at normal, fast and slow speeds, and to step by single frame and scan, in forward and reverse. There is no risk of disc wear or signal deterioration, because signals are "read" optically by the laser-scanning system.

\* Alternate videodisc players, Pioneer® Model III PR7820-3 and Sony® LDP-1000, are also plug-compatible with IVIS, but are not supported by Digital service agreements.

## Additional Hardware Requirements

Additional hardware required for operating IVIS are an RGB 13" color monitor,\* a videodisc player (or other NTSC video source), and the Professional 350 floor stand (for mounting the IVIS analog box). A 10 megabyte hard-disk mass storage subsystem is also required for most IVIS applications.

\*IVIS will also drive a Professional 350 black and white VR201 monitor, although it is not appropriate for most applications.



1. Professional 350 color monitor and cables
2. Professional 350 floor stand
3. Laser Videodisc Player
4. Personal computer keyboard
5. Professional 350 System Unit  
(Overleaf)
6. IVIS "Backpack" and additional components

# Complete IVIS System Packages

IVIS Learning Workstations are now available in a choice of two system packages. Both PRO IVIS/Videodisc System and PRO IVIS/Videodisc Touch System packages include:

- Complete Professional 350 workstation, with 10 MB Hard Disk
- IVIS analog "backpack" interface, including Professional's vertical floor stand, IVIS software drivers, IVIS subroutine libraries and appropriate color monitor cable headset
- VDP40 Laser Videodisc Player
- 13" high-resolution color monitor VR241-A for PRO IVIS/Videodisc System or VRTSI-A DECTouch touch screen for PRO IVIS/Videodisc Touch System
- Professional Operating System
- PRO/Interpreter applications software allows courseware developed with the VAX PRODUCER to be delivered on the Professional 350
- IVIS installation/verification videodisc
- All appropriate cables and user documentation

Both IVIS System Packages are customer installable because the new PRO 350 kernel (PC350-I) has been pre-configured specifically for IVIS. The standard bit-mapped video module board is replaced by the three IVIS interface modules that normally come with the PC3VS-AA IVIS option, and the black-and-white video cable is replaced with the appropriate color video cable.

## Choosing the Best IVIS System Package for You

While both IVIS System Packages offer state-of-the-art interactive delivery capability, the expanded PRO IVIS/Videodisc Touch System utilizes a high-resolution touch-sensitive screen for user response, and substitutes the VRTSI-A DECTouch color monitor and video cable for the standard IVIS monitor and cable. The PRO IVIS/Videodisc Touch System also accommodates such alternate positional input devices as a joystick, mouse or graphics tablet. (Further description of DECTouch can be found on a separate data sheet.)

## IVIS Option Supports Alternate Video Input Sources

The IVIS interactive video option, included in both IVIS System Packages, has the capacity to support two alternate video source inputs: broadcast quality videotape, live video cameras, cable or broadcast tuners, and videotex sources. Because software drivers are currently available only for laser videodisc players, control and overlay capability is presently limited to videodisc. To take advantage of the capability of switching between video and audio segments on two separate IVIS course videodiscs, a second videodisc player and accessory cables should be ordered as separate line items. Digital will supply customers interested in developing drivers for alternate video source devices with all available technical documentation and protocol information.

## Support Services

Digital Field Service offers a comprehensive one-year warranty for all parts and labor for each of the two IVIS System Packages. Additional service coverage is available after that time for a basic monthly charge under a standard Field Service contract.

Digital Educational Services also offers full consulting and custom courseware development services to help you take the best advantage of IVIS's capabilities. (For details, see the accompanying data sheet.)

## Availability

For U.S. customers, the PRO IVIS/Videodisc System will be available late January; the PRO IVIS/Videodisc Touch System late February.



## Specifications

### Analog "Backpack"

Height	24 <sup>7/8</sup> " (63cm)
Width	7 <sup>7/8</sup> " (19.9cm)
Depth	4 <sup>1/4</sup> " (10.8cm)
Weight	13 lbs, 14 oz (6.3Kg)

### Environment

Operating	54° to 104° F (15° to 40° C)
Relative Humidity	20 to 80%

### Electrical

AC Input	120V nominal Single phase, 3-wire, 87-128V rms at 47-63Hz  220-240V nominal Single phase, 3-wire, 174-256V rms at 47-63Hz
Input Current	120 Vac. 5A rms; 220 Vac. 25A rms
Overload Protection	Circuit breaker

### Serial Port

Serial, EIA Asynchronous
RS232C
50 to 19200 baud

### IVIS Video Mode

Refresh Rate	60Hz interlaced
Scan Lines	525 lines interlaced
Displayed Resolution (text and graphics)	960 horizontal by 240 vertical pixels (interlaced)
VR241-A Color Monitor	0.31mm dot pitch
VR241-A Weight	35 lbs (16Kg)

### Video Signals

Output Video Signal	RGB analog video signal with RS170 composite sync on green
Output Video Signal	RB video .7V p-p positive
Detail	G video .7V p-p positive, plus 0.34V sync
Output Load	75 ohm termination
Video Input Voltage	1.0V p-p nominal with 0.3V negative sync tip
Voltage Variation	0.47V to 1.21V p-p
Compensable	
External Sync Output	RS170 composite sync with negative sync tip. 4.0V p-p into 75 ohms
External Subcarrier	Frequency, 3.579545 MHz Voltage, 1.0V p-p continuous into 75 ohms
Black Burst Output	Voltage, 286mV composite syns + 286mV p-p subcarrier burst into 75 ohms

### Audio Signals

Stereo Inputs	50K ohms input impedance
Auxiliary audio output	1000 ohm output impedance
Audio Output	1 Watt/channel into 8 ohm load, 1A current limit

### Overlay enhancement

Drop Shadow Width	1 to 15 pixels (programmable)
-------------------	-------------------------------

## Videodisc Player

### General

Pick-up method                           Laser beam (reflective)  
Laser                                       He-Ne ( $\lambda = 6328\text{\AA}$ )  
Maximum playing time                   CAV: 30 min./side  
Spindle revolution                       CAV: 1800 r.p.m.  
Dimensions                               21 $\frac{3}{8}$  x 6 $\frac{1}{4}$  x 16 $\frac{3}{8}$  inches (542 x 160 x 415 mm) (w/h/d)  
Weight                                      43 lb 3 oz (19.6 kg)  
Power requirements                       120V ac  $\pm 10\%$ , 60 Hz  
AC out                                     Unswitched 120 V ac, max. 400W  
Power consumption                       110W  
Operating temperature                   10°C to 35°C (40°F to 95°F)

### Video

Signal                                     EIA standards, NTSC color  
Output                                     1.0 V(p-p), 75 ohms unbalanced, sync negative  
Resolution                               Color: 360 lines  
Signal-to-noise ratio                   42 dB  
VHF output                               Channel 3 or 4 (selectable) 75 ohms, unbalanced  
Input signals                             SYNC 4 V(p-p)  $\pm 1$  V(p-p), 75 ohms.  
   SC 2 V(p-p)  $\pm 0.5$  V(p-p), 75 ohms

### Audio

Output                                     Line out: Less than 2 k ohms  
  0  $\pm 2$  dB [V] (100% MOD, 47 k ohms load), unbalanced  
   Phones: 8 ohms, -19  $\pm 2$  dB [V]  
   More than 50 dB  
   40 Hz to 20 kHz ( $\pm 3$  dB)

### DECtouch

#### Touch Screen

Activation force                       1-2 ounces nominal (28-56 grams)  
Resolution                               .04 inches (1.0mm)  
Sampling rate                           10-400 samples/second (programmable)  
   100ms-2.5ms/sample corresponds nominally to 10in./sec.  
drawing speed

### Ports

2 serial positional device attachment ports with graphics tablet  
and serial mouse support  
2 parallel positional device attachment ports with joystick or  
single quadrature mouse support  
1 keyboard port  
Baud rate (programmable) of 5 to 19.2 K  
DECTouch requires P/OS Version 1.7. A special I/O positional  
device driver is included with the DECTouch Control Module  
to interface the applications software to the keyboard.

**digital™**

IVIS, DECTouch and Professional 350  
are trademarks of Digital Equipment  
Corporation.

Pioneer and Sony are trademarks of Sony  
Corporation of America and Pioneer Elec-  
tronic Corporation.

© Copyright Digital Equipment Corporation  
1984. All rights reserved.

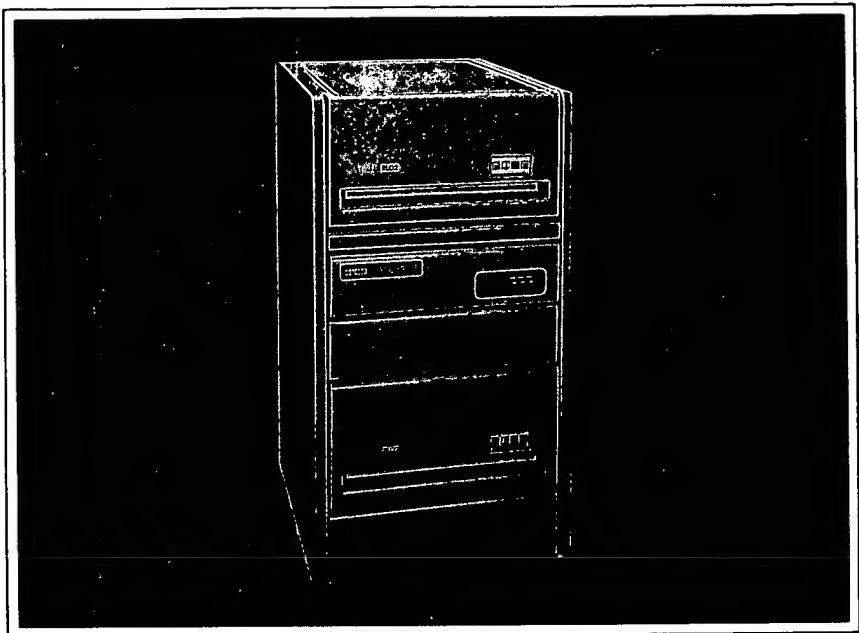


IVIS System Packages (including Videodisc Player)

50

1/84

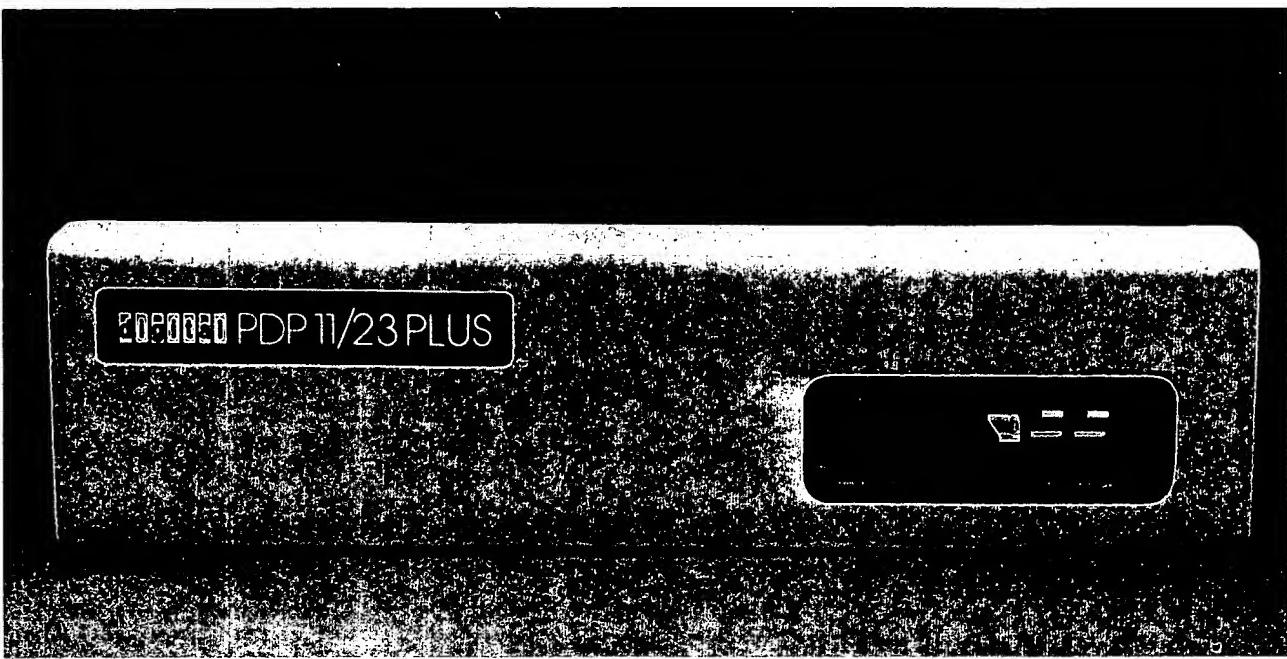
EA-30276-80



# PDP-11/23 PLUS

Q-bus Computer System

**digital**



## Economy, Power, and Expandability Come in a Small Package.

The low-cost PDP-11/23-PLUS delivers minicomputer performance by providing the addressing space and powerful software usually found only on larger, more expensive systems. It's an ideal system for technical and multiuser commercial applications that require between 20 and 40 Mbytes of removable disk storage.

Its wide range of operating systems, small size, fast response time, and relatively large memory make it a good choice for realtime applications—such as process control, instrumentation automation, and robotics—where the emphasis is on reliability, performance, and packaging.

The PDP-11/23-PLUS is also well-suited for distributed data processing and is capable of handling multiuser and multitasking applications traditionally performed by larger systems.

## Internal Design Efficiency Extends Flexibility and Capability.

Integral to the PDP-11/23-PLUS CPU is its proven NMOS microprocessor chip set. The CPU module itself contains the CPU, a memory management unit, a line frequency clock, a bootstrap/diagnostic ROM, and two serial line units—all within a single quad-height module.

Module design and engineering improve use of the system backplane, leaving up to six quad slots in the processor box open for expansion. Addition of an optional expander box increases to 14 the number of quad slots available for expansion.

The PDP-11/23-PLUS processor executes the standard PDP-11 instruction set, including both single- and double-operand instructions capable of operating with bit, byte, 16-bit word, and multiword data types.

The CPU executes instructions in either Kernel or User mode. Kernel

mode gives programs complete control of the central processor. In Kernel mode programs can execute all instructions. Operating system functions are frequently executed in Kernel mode. In User mode certain instructions can't be executed. Code running in the User mode is not likely to crash the Kernel program, even if the user code is flawed. This also means that one user can't cause another user's programs to crash. The two operating modes provide a measure of control and protection to the system programmer that is frequently missing from micros.

The memory management unit provides additional security in a multiuser, multiprogrammer environment.

The extended 22-bit Q-bus, with bidirectional asynchronous communications, allows the use of common bus interfaces for different devices and simplifies interfacing for hardware designers.

A self-diagnostic bootstrap located on the CPU module detects system faults and checks the viability of the central processor, memory, and console terminal interface.

---

## A Range of Options Suits Your Present and Future Needs.

---

A major advantage of the time-tested PDP-11/23-PLUS Q-bus system is the assortment of available options, including; among others, the DRV11 interface unit for data collection, IEEE instrument buses, printers, and digital interfaces.

Small systems are often limited to their initial storage capacity or can be difficult to expand. But the PDP-11/23-PLUS can easily expand to accommodate increased storage demands with a 512-Kbyte RX02 floppy disk drive or up to four 10-Mbyte RL02 removable disk drives for a maximum system total of 40 Mbytes of online disk storage. The system can also accommodate reel-to-reel tape drives and tape cartridges for economical backup, archiving, and data interchange with other computers.

---

## The PDP-11/23-PLUS Adds Power Through Packaging.

---

The PDP-11/23-PLUS is available in either cabinet-mounted or 5½-inch rack-mountable enclosures. We also produce a smaller version in a 3½-inch enclosure.

The system's modular construction allows for quick field repair and modification. Boards, fans, power supplies, and other components can be swapped quickly. Power supplies fold down to allow easy access to internal components. The cabinet design also provides cooling and shielding. Its internal cableways eliminate most folds and simplify cable installation.

A system distribution panel located behind the rear door of the CPU cabinet serves as an easy-access connection point for all serial lines and option cabling. This simplifies installation, reconfiguration, and relocation. Digital will install the system for you, or you can save money by installing it yourself.

---

## Choose from a Spectrum of Software and Operating Systems.

---

The versatility and flexibility of the PDP-11/23-PLUS is magnified by the wide variety of software systems, tools, and applications available. PDP-11 software is thoroughly time-tested and compatible across the PDP-11 computer line. You can develop software on one PDP-11 system and run it on any another suitably configured PDP-11.

The PDP-11/23-PLUS supports a vast pool of proven software-resources such as communications software, advanced programming languages, and numerous interactive operating systems including RSX, RT-11, RSTS/E, DSM-11, and UNIX\*.

RSX-11M-PLUS is a multiuser, multiprogramming, realtime operating system designed for a variety of applications including communications. The system has 250 software priority levels that let the user create, compile/assemble, debug, and install tasks without affecting realtime task response. Other versions of the system, RSX-11M and RSX-11S, are available to suit your specific requirements.

RT-11 is a disk-based, single-user, realtime operating system that also accommodates interactive program development of online applications. The emphasis in RT-11 is on efficient use of system resources, minimizing system requirements in the CPU and on mass storage, while maximizing system throughput. A multiterminal version of RT-11, called CTS-300, provides DIBOL computing for small groups.

Micro/Power Pascal is a development toolset for creating high-performance realtime multitasking software.

RSTS/E is a multiuser, timesharing, and resource-sharing general purpose system that is capable of batch processing, program development, and multiterminal applications.

DSM-11, Digital Standard MUMPS, is a multiuser data management system.

UNIX is a popular commodity time-sharing operating system that was developed by Bell Laboratories on Digital's PDP-11 computers.

A wide selection of programming languages is also available with the PDP-11/23-PLUS, including:

- MACRO-11
- BASIC-PLUS-2
- COBOL-81
- FORTRAN IV
- BASIC-11
- FORTRAN'77
- DIBOL
- CORAL 66
- PASCAL

UNIX is a trademark of Bell Laboratories

---

## Communications Capabilities Offer Powerful Integration.

---

Digital offers extensive network communications products for local area networking, wide area networking, and intervendor communications.

Digital Network Architecture (DNA) is the overall design for Digital's communication software. DNA provides for advanced capabilities such as adaptive routing, which increases the reliability of message transmission through alternate routes and cuts down on the number of individual physical links required in a network. Remote users can submit programs to any network node for efficient execution. DNA allows managers to oversee network operations with automated procedures that reconfigure the network, detect and work around failures, and tune the system for best performance.

DECnet products are used to build all-Digital networks that can include personal computers, PDP-11 and VAX systems, and DECSystem-10s and -20s.

Internet software products connect the PDP-11/23-PLUS to non-Digital systems. The variety of Internet products include protocol emulators for connection to IBM, CDC, and UNIVAC systems.

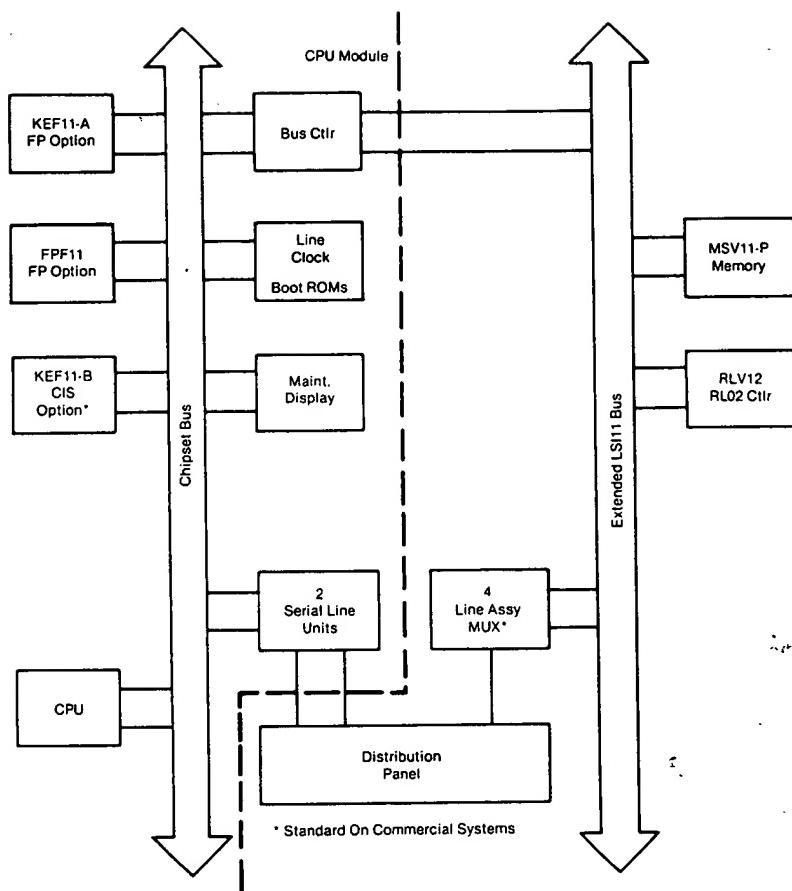
Packetnet communication software is used to connect systems to public packet-switching networks through such protocols as X.25.

Additionally, the PDP-11/23-PLUS can connect to Ethernet. Ethernet is a local area network specification for communications protocols developed jointly by Xerox, Intel, and Digital that further extends the possibilities for effective communication and resource-sharing within the framework of DECnet.

## For More Information...

Ask your sales representative for a copy of the PDP-11 Architecture Handbook, the PDP-11 Software Source Book of applications, or information about PDP-11 operating systems. If you prefer, write to:

Digital Equipment Corporation  
ATTN: Media Response Manager  
200 Baker Avenue  
Concord, Ma. 01742



PDP-11/23-PLUS Hardware Organization

---

## **PDP-11/23-PLUS, the Reliable, Low-Cost System That's Ready to Change When You Are.**

---

Today, one system gives minicomputer performance at a micro-computer price with a range of flexibility unmatched in the industry.

The PDP-11/23-PLUS from Digital brings you features that most micros lack, such as significant expansion space for growth and up to 40 Mbytes of removable disk storage. It also has a wide range of hardware and software options that are compatible with larger and smaller systems, and sophisticated, proven networking software.

All of this is available at a micro, or "team computer," price.

In areas such as realtime, distributed processing, process control, or data acquisition, the PDP-11/23-PLUS is the most cost-effective answer to your small system computing needs.

You may outgrow your initial computer configuration, as your needs for memory, storage, or terminals change. When you do, the PDP-11/23-PLUS can keep pace because it's been designed with expansion in mind.

---

### **Highlights**

---

- A compact, single-board 16-bit CPU keeps power requirements low and expansion capability high.
- The optional Commercial Instruction Set (CIS) enhances the performance of COBOL-81 and DIBOL program compilation and execution.
- An optional hardware floating-point processor increases the execution speed of scientific programs.
- Two operating modes provide an extra measure of system protection.
- Up to four Mbytes of parity memory accommodates more active users and programs, and improves response time in multiuser and multitasking environments.
- Memory management provides dynamic memory relocation, segmentation, and protection in multitasking environments.
- Four levels of vectored bus-interrupt protocol improve I/O performance.
- The distribution panel provides easy system expansion and convenient interfacing to a wide variety of disks, tapes, terminals, printers, and realtime I/O devices.
- Optional half-inch reel-to-reel tape drives, as well as tape cartridges, provide industry-standard mass data storage.
- A choice of multiple operating systems and thousands of application packages are available now.

## Specifications



The following PDP-11/23-PLUS configuration specifications have been approximated for both the dual-RL02 systems cabinet and the rack-mountable processor versions.

### DUAL RL02 SYSTEM CABINET

#### Power Requirements

AC Power	120 V	240 V
Phasing	Single	Single
Frequency	50/60 Hz	50/60 Hz
Voltage Tolerance	90 - 132 V RMS	180 - 264 V RMS
Frequency Tolerance	47.5 - 63 Hz	47.5 - 63 Hz
Maximum Running Current	9.3 A	4.6 A
Maximum Startup (10 Sec)	16	8
Maximum Power Consumption	840 W	840 W
Plug Types	NEMA 5-15P	6-15P

#### Physical Characteristics

Dimensions	H9642 cabinet is 106 cm high × 54.1 cm wide × 76.2 cm deep (41.75 in × 21.25 in × 30 in)
Weight	170.25 kg (375 lbs)

#### Operating Environment

Temperature	10 - 40 °C (50 - 104 °F) at sea level
Relative Humidity	10 - 90% (noncondensing)
Maximum Wet Bulb	28 °C (82 °F)
Maximum Altitude	to 2.44 km (8,000 feet)

### 5 1/4-INCH RACK-MOUNTABLE CPU BOX

#### Power Requirements

AC Power	120 V	240 V
Phasing	Single	Single
Frequency	50/60 Hz	50/60 Hz
Voltage Tolerance	90 - 132 V RMS	180 - 264 V RMS
Frequency Tolerance	50/60 Hz	50/60 Hz
Maximum Running Current	47 - 63 Hz	47 - 63 Hz
Maximum Power Consumption	6 A	3 A
Plug Types	540 W	540 W
Plug Types	NEMA 5-15P	NEMA #5-15P

#### Physical Characteristics

Dimensions	CPU chassis is 13.2 cm high × 48.3 cm wide × 68 cm deep (5.2 in × 19 in × 26.8 in)
Weight	21.4 kg (46.5 lbs)

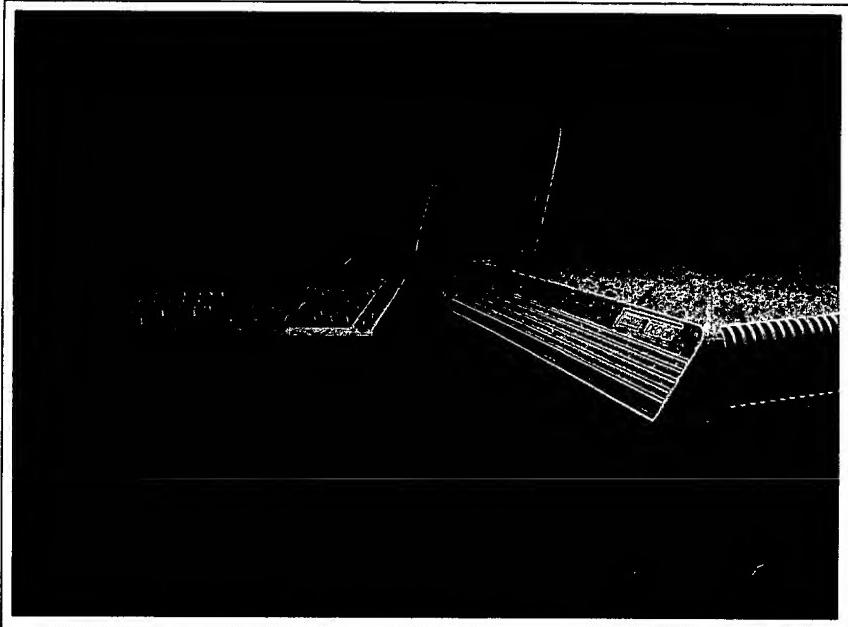
#### Operating Environment

Temperature	5 - 50 °C (41 - 122 °F) at sea level
Relative Humidity	10 - 95% (noncondensing)
Maximum Wet Bulb	32 °C (90 °F)
Maximum Altitude	to 2.44 km (8,000 ft)

The information in this document is subject to change without notice and should not be construed as a commitment by Digital Equipment Corporation. Digital Equipment Corporation assumes no responsibility for any errors that may appear in this document.

The following are trademarks of Digital Equipment Corporation: DEC, DECSYSTEM-10, DECSYSTEM-20, DECUS, DECmate, DECnet, DECwriter, DIBOL, the Digital logo, MASSBUS, PDP, P/OS, Professional, Rainbow, RSTS, RSX, UNIBUS, VAX, VMS, VT.

digital



# DECtalk

Text-to-Speech System

digital

## **DECtalk Offers Unmatched Voice Quality.**

DECtalk succeeds where other systems fail in the quality of the speech that it generates. Unlike existing text-to-speech systems, DECtalk is based on a unique three-level processing approach — an approach that yields unmatched natural speech.

### **Three-Level Processing Is the Key.**

Why is human speech so difficult to simulate? Attempts to simulate human speech characteristics through text-to-speech systems have simply not been able to match the dynamic qualities of human voice. Until now, the result has been monotone, machine-like voices with very limited vocabularies.

But DECtalk changes all that with unmatched human voice quality and vocabulary capability. Using a unique three-level processing approach, DECtalk combines sophisticated linguistic principles and the latest advances in voice, microprocessor, and signal-processing chip technology. The result is a text-to-speech system that more clearly resembles human speech than any other system available.

At the first level of the process, DECtalk accepts ASCII text from a computer. It then converts the text into a pronunciation code using a unique combination of dictionaries and letter-to-sound rules.

At the second level of the process, DECtalk converts the code (phonemic text) produced at the first level into control messages calculated every 6.4

milliseconds. In contrast to the first level, which dealt only with individual words as the basis for its selection of phonemes (the basic building blocks of words), the second level deals with the effects of surrounding words on individual pronunciations. Once this conversion is done, DECtalk perfects its speech output by applying its rules for intonation, duration, and word stress. It is this final step that produces the high-quality speech that sets DECtalk apart from the monotone, robot-like voices of lower-quality systems.

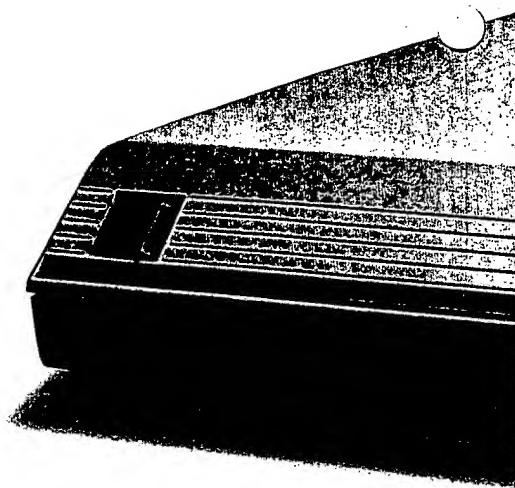
At the third level of the process, DECtalk's digital signal processor uses the control messages created at the previous level to "synthesize" voice waveforms. This is done by sending pitch pulses through a series of resonators and transmitting the waveforms to the digital-to-analog converter at the rate of 10,000 samples per second.

### **DECtalk Has Unlimited Vocabulary.**

To achieve the high-quality speech needed for demanding applications, a text-to-speech system needs both a large dictionary and a large library of rules.

Unlike less advanced systems, DECtalk uses two dictionaries for more precise pronunciation. Its large, built-in dictionary includes familiar and frequently used words, numbers, and abbreviations. Its smaller dictionary has room for users to define application-specific terms and abbreviations. Using this smaller dictionary, users can customize DECtalk for particular applications.

In addition to its dictionaries, DECtalk also includes a library of letter-to-sound rules that increases its pronunciation capabilities even more. Using these letter-to-sound rules, DECtalk can generate "best-guess" estimates for unfamiliar words or letter combinations not found in its dictionaries. DECtalk's dictionaries and letter-to-sound rules enable DECtalk to generate exact pronunciations for over 20,000 words.



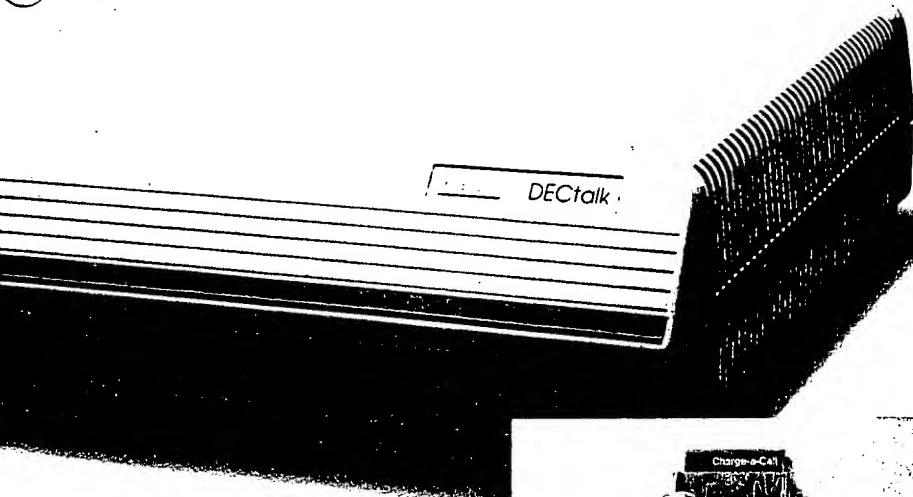
### **You Control Voice Type and Voice Rate.**

High-quality speech involves more than just precise pronunciation. It requires voice variety too. And that's where DECtalk excels. DECtalk "speaks" with a wide range of voices, rates, and intonation patterns to give messages variety and emphasis.

DECtalk has several built-in voices and one user-definable voice. Simple commands allow you to change the speaking voice and the speaking rate for a variety of text-to-speech options.

But controlling voice type and rate is only part of the DECtalk story. DECtalk takes voice synthesis one step further by allowing you to modify existing voice types or create new voices and special effects. These modifications include:

- Voice (male/female/child)
- Speaking rate
- Baseline pitch
- Pitch range
- Breathiness
- Smoothness
- Head size
- Forte
- Laryngealization
- Pauses



### Getting Started Is Easy.

DECTalk is easy to use and easy to install. A stand-alone box, DECTalk consists of a logic board, connectors, power supply, and built-in speaker. You can install DECTalk in a matter of minutes. Simply plug DECTalk into a standard wall socket (115 V or 220 V) and connect one cable from DECTalk to any RS232C (EIA) computer terminal port.

You can also connect DECTalk to any Touch-Tone™ telephone<sup>1</sup> using standard telephone line connections.

### Built-in Diagnostics Simplify Maintenance.

DECTalk comes with powerful built-in self-diagnostics. Once DECTalk's power switch is turned on, DECTalk tests itself and tells you whether it's ready to run or not. And if there is a problem, DECTalk identifies it for you through an LED status display located on its control panel.

<sup>1</sup> Touch-Tone is a trademark of the Bell System.

### DECTalk Suits a Variety of Applications.

Digital recognizes that different users have different needs and so we designed DECTalk with the flexibility you need to meet a variety of applications. DECTalk can be configured with a CPU sending voice output to a speaker. Or it can interact with a user over a telephone. It can also be used in conjunction with a CRT.

Whatever your text-to-speech requirements, DECTalk offers you both the flexibility you'll need and the capabilities you'll require.

### Office Automation.

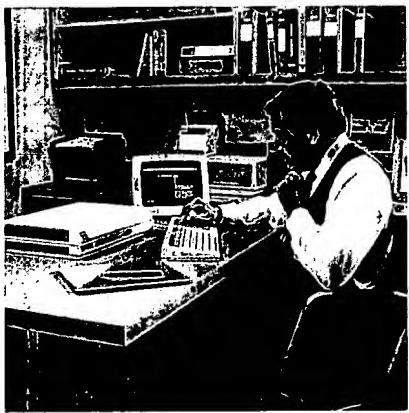
Looking for an easier and more cost-effective way to access information stored in your office database or electronic mail system? Until now, you needed a computer terminal to access that information.

DECTalk changes that, letting you access the information you need with only a phone call. Access to information stored in databases and electronic mail systems through DECTalk and a Touch-Tone telephone is just one of the many ways DECTalk can be part of your office automation plans. The almost universal availability of telephone service throughout the world, coupled with DECTalk's Touch-Tone recognition capabilities, makes DECTalk an ideal tool for enhancing your office automation picture.

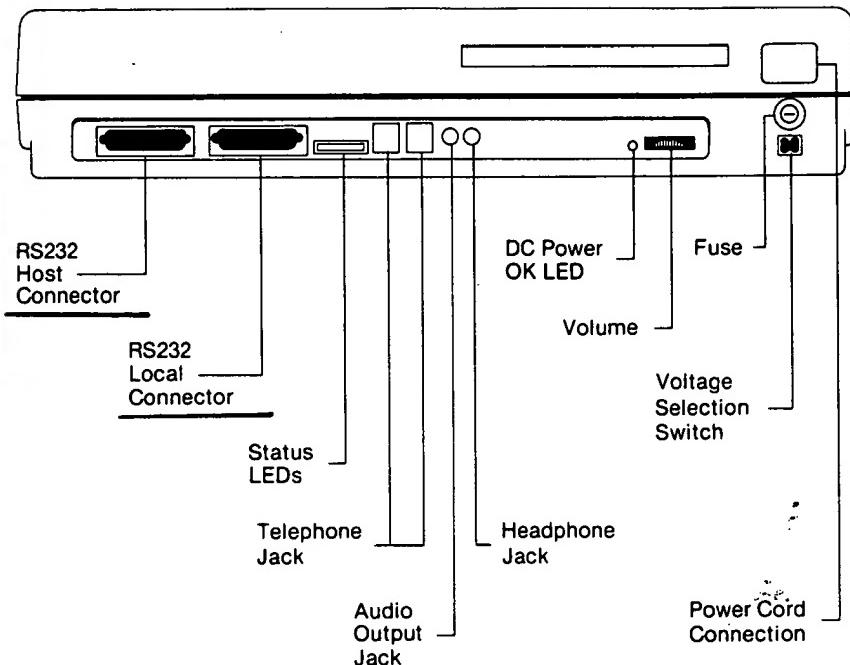
### Database Inquiry.

Providing terminals to every company employee or to any large number of users limits access to most databases today.

But, DECTalk changes that, allowing your employees to access databases without terminals. Link DECTalk to a host computer and you can access the information you need with a phone call. Whether you want to check a bank balance, quote an insurance claim, or update your inventory, DECTalk can help.



Back Connector Panel



### Training and Instruction.

DECTalk's natural, human-quality voice makes it an ideal learning tool, allowing students to hear as well as read messages.

For students learning English as a second language, DECTalk's high-quality speaking voice makes it a perfect teaching aid. Unlike conventional language tools that limit students to set lessons and vocabularies, DECTalk offers almost unlimited possibilities. With DECTalk, students can hear the text they are reading, allowing them to spend more time working with the language and less time trying to interpret it.

### An Aid for the Handicapped.

One of DECTalk's strengths is as a tool for the handicapped. Whether used as a reading machine for a blind person or as a practical speaking aid for someone with a vocal disability, DECTalk opens up a whole new world of opportunities.

### An Alternative To A Video Display.

In some situations, voice is the most efficient way to convey information. For engineers working on computer-aided design systems, DECTalk can supply additional information they need while working on a design on a video terminal.

In robotics, DECTalk opens up new ways of communicating. Instead of communicating solely by blinking lights and audio beeps, DECTalk-equipped robots can "speak" in an understandable, human-quality voice.

### Let DECTalk "Speak" for Itself.

These are just some of the many ways DECTalk can expand your communications capabilities. Applications are limited only by imagination.

But why only read about DECTalk? Why not let DECTalk "speak" for itself by contacting your nearest Digital representative or by calling 617-493-talk. Natural human-quality voice is here today ... with DECTalk.

---

## **DECtalk Expands Your Computer Capabilities by Adding Voice.**

---

Until now, if you wanted to use computer-generated voice to convey a message, you had to settle for simple messages and robot-like voices. The DECTalk system changes that. Offering natural-sounding voice quality and flexibility, DECTalk is going to change your thinking about text-to-voice systems.

The secret to DECTalk's performance? A unique combination of state-of-the-art voice, microprocessor, and signal-processing chip technology. DECTalk accepts standard ASCII text from your computer and converts it into natural, human-quality voice. Voice that you control by choosing both the voice type and the voice rate. DECTalk gives you the flexibility you need for a wide range of applications.

Why limit your messages to text alone ... when there's DECTalk. It's the human-quality voice computers have been waiting for.

---

### **Highlights**

---

- Converts standard ASCII text into natural, human-quality speech.
- Choice of types of voices (male/female/child).
- Variable speaking rate from 120 to 350 words per minute.
- Unlimited vocabulary with pronunciation precision of over 20,000 words.
- User-specified auxiliary dictionary for trade terms, acronymns, and other special words.
- Pronunciation and intonation control.
- Accepts input from any computer via standard RS232C terminal port.
- Allows input to computer from Touch-Tone™ keypad.
- Voice output to a built-in speaker, headphones, audio jack, or telephone.
- Both terminal and telephone line control.
- Built-in self-test diagnostics.
- User installable.

## Specifications

### Dimensions

Height: 4 in (10.0 cm)  
Width: 18 in (45.0 cm)  
Depth: 12 in (30.0 cm)  
Weight: 16 lb (7.3 kg)

### Interface

Connection to any Digital system supporting RS232C  
serial port and XON/XOFF protocols

### Baud Rates

110, 300, 600, 1200, 75/  
1200, 2400, 4800, 9600

### Format

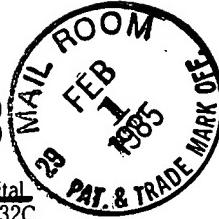
ASCII characters  
7 bits and even  
7 bits and odd  
8 bits and none  
ANSI compatible control sequences

### Electrical Requirements

95 to 128 V, 47 to 63 Hz, or  
190 to 256 V, 47 to 63 Hz

### Operating Conditions

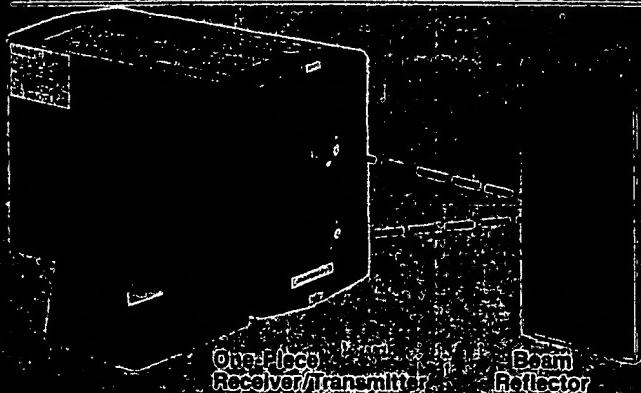
Relative Humidity: 10 to 90%  
Temperature: 10 to 40 °C  
(50 to 104 °F)



The information in this document is subject to change without notice and should not be construed as a commitment by Digital Equipment Corporation. Digital Equipment Corporation assumes no responsibility for any errors that may appear in this document.

The following are trademarks of Digital Equipment Corporation: DECTalk, MICRO/PDP-11, DEC, DECsystem-10, DECSYSTEM-20, DECUS, DECmate, DECnet, DECwriter, DIBOL, the Digital logo, MASSBUS, PDP, P/OS, Professional, Rainbow, RSTS, RSX, UNIBUS, VAX, VMS, VT.

I



### Announcer With Invisible Infrared Protection

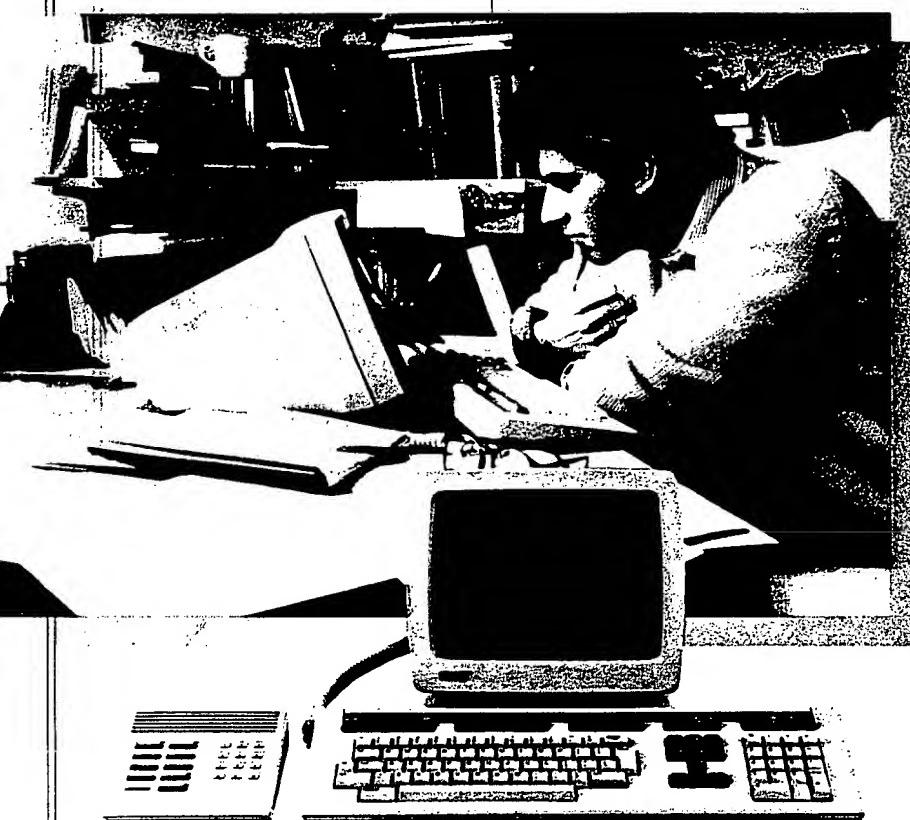
69.95

Worried about break-ins? Worried about your home or office? People Worried About Security are worried too.

Round-the-clock protection at a low price! An invisible infrared beam of invisible light across a space of up to 50 feet to the reflector, which bounces it back. When the beam is broken, the built-in Triggered Alarm can be set to sound automatically, continuously with manual reset, or sound for ten seconds after beam is broken. The unit features an LED test alignment indicator and built-in buzzer plus outlet for connection of optional 12VDC bell or siren. 4 1/8" x 3" x 7 1/4". With adjustable mounting bracket. U.L. listed AC operation. 49-201

69.95

# PROFESSIONAL 300 SERIES<sup>TM</sup> TELEPHONE MANAGEMENT SYSTEMS



## THE OFFICE OF THE FUTURE

The office of the future. We stand on its threshold. Think about it. The primary goal of any office is to increase the productivity of its staff as they process and communicate the daily flow of information. The Professional Series is currently capable of managing two important levels of information—text and graphics. But a third classification exists which is an integral part of any office but whose potential is as yet untapped—the human voice.

In business, there is a great need to transfer information over the telephone. Some of this information is best imparted as conversation and some is best conveyed as text and data. The Telephone Management System (TMS) for the Professional 350 is a personal productivity tool which provides this synergy of media on your personal computer. The office of the future will not change the way you think about information. Rather, it will improve your productivity in the way you manage information today.

digital

## DESIGNED FOR EFFICIENCY

Managing voice communications with a personal computer today is no simple matter. You need telephone books, a Rolodex, a place for your secretary to stack your phone messages, a dictation machine, cassettes . . . the list seems endless. The Professional Series Telephone Management System can eliminate this confusion by bringing increased efficiency to office communications.

The TMS option, which is supported by the PRO/Communications software, is opening up a wide range of new telecommunications applications.

Because of its ability to combine text and voice, TMS can offer you the following resources integrated into a single package:

- / A telephone
- / A hands-free conference phone
- / An automatic dialer
- / A personal phone directory
- / A 300/1200 baud modem for VT100 and VT125 terminal emulation

TMS defines compatibility without restricting growth. Application software is being developed by Digital and others to offer additional capabilities including:

- / An automatic answering machine
- / A dictation machine that can be edited via a voice store and forward system
- / A centralized dictation system that will accept voice entry from any telephone

In essence, TMS will become your most versatile office tool. TMS with PRO/Communications software can be used for:

Conference calling - The TMS voice unit comes equipped with a speaker and microphone for hands-free operation. After dialing from the voice unit keypad (both tone and pulse dialing), this capability can be used to bring your associates into a phone conversation for a conference call.

Autodial from a Telephone directory - TMS supports the Professional Phonebook. A directory maintenance and autocall system enables you to call an individual or a publicly accessible database if you know their name. You can let your personal computer remember their number. If the line is busy, it will dial again until the connection is made.

Terminal Emulation - Enables your personal computer to operate like a VT100, or VT125 terminal using the modems built into the TMS option card.

File Transfer - Allows the user to transfer files between Professional 350s or from Professional 350s to RSX and VMS systems using the TMS integral modems.

## HARDWARE FEATURES

The Telephone Management System consists of three units:

- / The Telephone Line Interface
- / The Controller Board Option
- / The Professional Voice Unit

The Telephone Line Interface provides standard phone jack connectors to two telephone lines and a local telephone handset. These jacks support single and multiline telephones. An audio jack is also supplied for connecting the voice unit.

The Controller Board, which uses one of your option slots in the system unit, includes:

- / 300/1200 baud integral modem with BELL 103J and 212A (asynchronous) compatible modes
- / Touchtone transceiver to send and receive touchtone signals
- / CODEC for encoding and decoding voice from either one of the telephone lines or from the Voice Unit at 32K bits per second
- / Call progress tone detector for detecting dial tone, busy, and ringback
- / An analog switch that can connect any of the devices to either of the telephone lines, the Voice Unit, or your telephone handset

The Professional Voice Unit has a microphone and speaker for voice input and output. One side of the box has a familiar push-button telephone pad, the other resembles a standard dictaphone machine with additional keys to take advantage of TMS's unique capabilities.

With TMS you can buy the information management capabilities you need today and add more when your needs change. Think about what TMS can do for you now—and ten years from now.

Digital reserves the right to make changes at any time, without notice, in prices, materials, equipment, software, specifications, and models. DEC, PDP, VAX, Ergodynamic, Professional Operating System, PPOS, Professional 350, Professional 325, DECMate II, Rainbow 100, Softsense, DECSnet, DECnet, DECmail, VT100, VT125, LQPO2, LA100, and LA50 are trademarks of Digital Equipment Corporation.

CP/M is a registered trademark of Digital Research, Inc.  
© Copyright Digital Equipment Corporation 1982  
All rights reserved.



K.

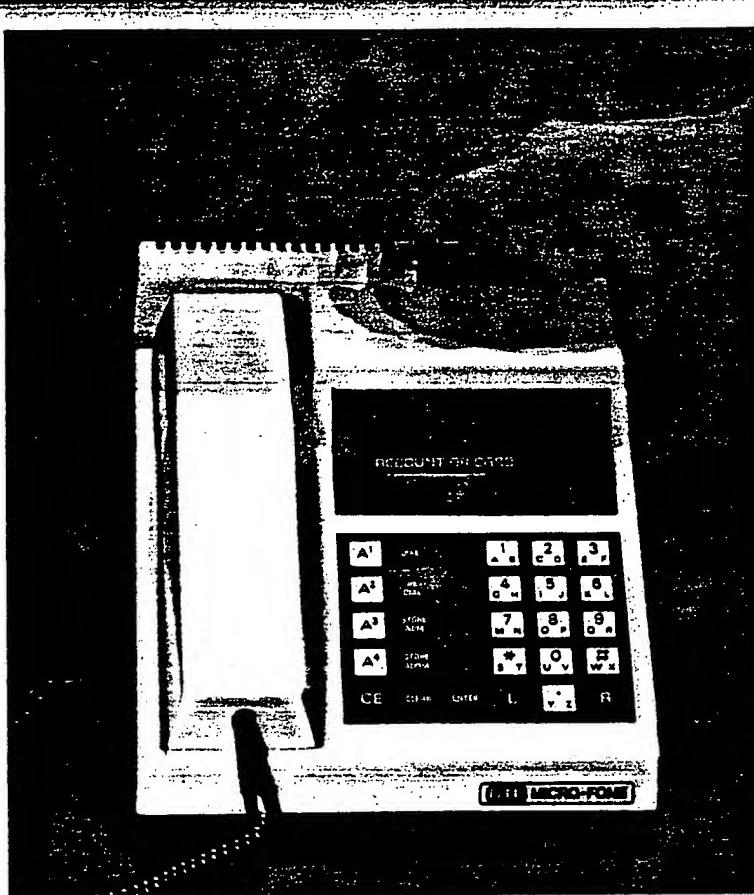
# Micro-Fone®

**M**icro-Fone is a special purpose terminal for handling the process of credit and check verification. Introduced by GTE Telenet in 1980 Micro-Fone has quickly become the overwhelming choice of banks and financial institutions serving large numbers of retailers for their credit verification needs.

Micro-Fone enables a merchant to perform credit and check verification in less than 20 seconds, a significant improvement over present methods. Micro-Fone reads the information on the magnetic strip of the back of the credit card. When the retailer presses a button on the instrument, the information is transmitted and verified at the data center — perhaps hundreds of miles away.

Micro-Fone also functions as a normal telephone, saving more money by replacing an existing unit. With its built-in memory, it can store up to 14 frequently dialed numbers which can be dialed at the touch of a button.

Micro-Fone. Helping bankers, financial institutions and retailers advance into the Information Age.



(top) Micro-fone terminals perform credit and check verification fast—typically in less than 20 seconds (LL) Micro-fone also functions as a normal telephone and can "remember" 14 frequently dialed telephone numbers (LR). Micro-fone is easy to use and easy to learn.



Order No. AA-AK72A-TE

# VAX DRAW USER'S GUIDE

---

January 1984

This manual explains how to use the DRAW graphics language to develop screen displays for computer-based instruction and informational applications. Created on VAX/VMS, DRAW supports DESIGN courses and applications that run on a variety of operating systems.

Operating System and Version: VAX/VMS V3.4

Software Version: V1.0

Digital Equipment Corporation

---

The information in this document is subject to change without notice and should not be construed as a commitment by Digital Equipment Corporation. Digital Equipment Corporation assumes no responsibility for any errors that may appear in this document.

The software described in this document is furnished under a license and may be used or copied only in accordance with the terms of such license.

No responsibility is assumed for the use or reliability of software on equipment that is not supplied by DIGITAL or its affiliated companies.

Copyright (c) 1983 by Digital Equipment Corporation. All rights reserved.

The postage-paid READER'S COMMENTS form on the last page of this document requests your critical evaluation to assist us in preparing future documentation.

The following are trademarks of Digital Equipment Corporation:

---

<b>digital</b>	Digital	RSX
ALL-IN-1	IVIS	Tool Kit
DEC	MASSBUS	UNIBUS
DECmate	MICRO/PDP-11	VAX
DECnet	PDP	VMS
DECsystem-10	P/OS	VT
DECSYSTEM-20	Professional 300	Work Processor
DECUS	Rainbow 100	
DECwriter	RSTS	

---

Printed in U.S.A.

---

# Contents

## Preface

### Chapter 1. Getting Started with DRAW 1-1

- What is DRAW? 1-2
- Creating a DRAW.INI File 1-2
- Starting a DRAW Session 1-3
- Entering DRAW Commands 1-4
- Specifying File Names 1-5
- Using DRAW Attributes 1-6
- Working from Storyboards 1-7

### Chapter 2. Developing Screen Displays with DRAW 2-1

- Creating the Sample DRAW.INI File 2-2
- Entering DRAW and Creating a Sample Form 2-2
- Creating a New Form with DRAW—Sample 2 2-7
- Identifying Separate Forms in the Workspace—Samples 3 and 4 2-9
- Accessing DRAW Forms in Display Libraries 2-11
- Specifying Logical Names 2-13

---

## **Contents**

---

### **Chapter 3. Sample Applications For Nongraphics Terminals**

- Nongraphics Terminal Capabilities 3-1
- Specifying Position Sequences on Nongraphics Terminals 3-4
- Sample Storyboard Frame 3-6
- Graphic Techniques for Nongraphic Terminals 3-7
- Using Attributes with Nongraphics Terminals 3-11
- Creating Menus with DRAW 3-13

### **Chapter 4. Sample Application for Graphics Terminals 4-1**

- Graphics Terminal Capabilities 4-1
- Specifying Position Sequences on Graphics Terminals 4-3
- Sample Storyboard Frame 4-6
- Graphic Techniques for Graphics Terminals 4-6
- Using Attributes with Graphics Terminals 4-14
- Writing Modes 4-19

### **Chapter 5. Sample Applications with IVIS 5-1**

- Developing an IVIS Course 5-1
- Components of a Completed IVIS Course 5-3
- Using DRAW Forms to Control the Videodisc Player 5-4
- Sample Storyboard Frames with IVIS 5-5
- Creating Video Ports 5-12

---

## Contents

---

### Chapter 6. DRAW Graphics Commands 6-1

- .ALL Command 6-4
- .ANIMATE Command 6-6
- .ARC Command 6-8
- .AT Command 6-10
- .BELL Command 6-12
- .BLOCK Command 6-13
- .BOX Command 6-15
- .CENTER Command 6-18
- .CGL Command 6-20
- .CHOICE Command 6-21
- .CIRCLE Command 6-23
- .CLEAR Command 6-24
- .CODE Command 6-27
- .CURVE Command 6-30
- .DOUBLE Command 6-32
- .END Command 6-34
- .ERASE Command 6-36
- .FORM Command 6-39
- .IVIS Command 6-41
- .LET Command 6-45
- .LINE Command 6-46
- .LOOP Command 6-48
- .MACROGRAPH Command 6-50
- .MENU Command 6-50
- .NORMAL Command 6-54
- .PAUSE Command 6-56
- .PLOT Command 6-58
- .PROFESSIONAL Command 6-60
- .REMARK Command 6-61
- .SCREEN Command 6-62
- .SCROLL Command 6-64
- .SET COLOR Command 6-66
- .SET FEEDBACK Command 6-68
- .SET RESPONSE Command 6-70
- .TEXT Command 6-72
- .VK100 Command 6-74
- .VT52 Command 6-75
- .VT100 Command 6-76
- .VT125 Command 6-77
- .WRITE Command 6-78

## Contents

### **Chapter 7. DRAW Editing Commands 7-1**

- @APPEND Command 7-4
- @COMPILE Command 7-6
- @COPY Command 7-8
- @DELETE Command 7-9
- @EDIT Command 7-10
- @EXIT Command 7-12
- @GET Command 7-13
- @GRID Command 7-15
- @HELP Command 7-17
- @HOME Command 7-19
- @IDENTIFY Command 7-20
- @INITIALIZE Command 7-22
- @INSERT Command 7-23
- @LIBRARY Command 7-24
- @LINK Command 7-26
- @LIST Command 7-28
- @MOVE Command 7-30
- @NEW Command 7-31
- @OLD Command 7-32
- @PLOT Command 7-34
- @PURGE Command 7-35
- @QUIT Command 7-36
- @RELOCATE Command 7-37
- @REPLACE Command 7-39
- @REVERSE Command 7-40
- @SAVE Command 7-41
- @SET Command 7-42
- @SET COMPILE Command 7-44
- @SET DEFAULT Command 7-45
- @SET TERMINAL Command 7-46
- @SPAWN Command 7-47
- @SUBSTITUTE Command 7-48

## Contents

**Appendix A. DRAW Attributes** A-1

**Appendix B. DRAW Error Messages** B-1

**Index** I-1

### **Figures**

- Figure 1-1 Screen Display as You Enter DRAW 1-4
- Figure 2-1 Screen Display for the First Sample Form 2-5
- Figure 3-1 Screen Display for @GRID 3-5
- Figure 3-2 Sample Storyboard Frame 3-6
- Figure 3-3 Finished Screen Display for Sample Application 3-11
- Figure 3-4 Screen Display for Vertical Menu 3-15
- Figure 3-5 Screen Display for Horizontal Menu 3-17
- Figure 3-6 Screen Display for Multilevel Menu 3-19
- Figure 4-1 Sample Storyboard Frame 4-6
- Figure 4-2 Finished Screen Display for Sample Application 4-13
- Figure 4-3 The Shading Attribute with a Triangle 4-16
- Figure 4-4 The Shading Attribute with Circles 4-17
- Figure 4-5 The Shading Attribute with Rectangles 4-18
- Figure 5-1 Sample Storyboard Frame for a Videodisc Play Sequence 5-46
- Figure 5-2 Screen Display for First Sample IVIS Application 5-8
- Figure 5-3 Sample Storyboard Frame for Videodisc Still Display 5-9
- Figure 5-4 Screen Display for Second Sample IVIS Application 5-11
- Figure 6-1 Screen Display for .ARC 6-9
- Figure 6-2 Screen Display for .BOX 6-17
- Figure 6-3 Screen Display for .CURVE 6-31
- Figure 7-1 Screen Display for @GRID 7-16

### **Tables**

- Table 3-1 Attributes Available for Use on Nongraphics Terminals 3-3
- Table 4-1 Attributes for Graphics Terminals 4-14
- Table 6-1 DRAW Graphic Commands 6-1
- Table 6-2 Default Terminal Characteristics 6-24
- Table 7-1 DRAW Editing Commands 7-2
- Table 7-2 DRAW Line Editing Keys and Control Sequences 7-11
- Table A-1 DRAW Attributes A-1

---

## Preface

### **Manual Objective**

This manual provides complete tutorial and reference information for the DRAW graphics language.

### **Audience**

The audience for the *DRAW User's Guide* is an application programmer or course developer who is familiar with the VAX/VMS operating system, its file utilities, and one of its editors.

## Preface

### **Manual Structure**

Chapter 1	gives an overview of the DRAW graphics language.
Chapter 2	describes how to create screen displays with DRAW.
Chapter 3	shows how to create screen displays for non-graphics terminals.
Chapter 4	shows how to create screen displays for graphics terminals.
Chapter 5	shows how to create DRAW forms that control a videodisc player, or screen displays that you can overlay on top of video images.
Chapter 6	describes all DRAW graphic commands in alphabetical order.
Chapter 7	describes all DRAW editing commands in alphabetical order.
Appendix A	contains a reference list of all DRAW video attributes.
Appendix B	lists DRAW error messages.

### **Related Documents**

You can find additional information related to the DRAW graphics language in the following documents:

- *VAX DESIGN User's Guide*
- *VAX DESIGN Language Reference Manual*
- *VAX PRODUCER Pocket Reference Guide*

---

## Preface

### Syntax Conventions

Chapters 6 and 7 describe DRAW graphics and editing commands in detail. The following conventions apply to syntax statements provided for each command:

**UPPERCASE**

Uppercase printing in syntax formats indicates a keyword that you must type as shown.

**lowercase**

Lowercase printing in syntax formats indicates a clause, statement, name, or value that you supply.

**[ ]**

Square brackets enclose optional elements of syntax.

**Color**

Red print indicates information that you type.

# **5**

---

## **Sample Applications with IVIS**

This chapter explains how to use DRAW with IVIS, DIGITAL's Interactive Video Information System. It tells you how to create DRAW forms that control the videodisc player and screen displays that overlay video images.

### **Developing an IVIS Course**

An IVIS course runs on a PRO-350 system with the IVIS option. However, you develop the course on a VAX/VMS host using the PRO-350 as a VAX terminal.

You produce the program for an IVIS course using the DESIGN Authoring System. The steps in the DESIGN development process are:

1. Create source code with a standard editor.
2. Compile the source code into a pseudo-code output file.

## Sample Applications with IVIS

3. Execute and debug the code using a pseudo-code interpreter on the VAX.
4. Deliver the course on the VAX or transfer the pseudo-code files to the PRO-350, and execute them using the PRO-350 version of the interpreter.

For more information about DESIGN programming, refer to the *DESIGN Language Reference Manual* and the *DESIGN User's Guide*.

DRAW display libraries are another component of an IVIS course. DESIGN uses these display libraries for most of the computer-generated visuals in the course. In addition, DRAW forms in the library control a videodisc player to output video sequences to the screen. Thus, the videodisc player operates under control of the DESIGN program, called by DRAW forms.

As with the DESIGN program, you also develop the DRAW forms on a VAX using the PRO-350 as a VAX terminal. The DRAW forms you develop can contain any of the following:

- Computer-generated text
- Computer-generated graphics
- Videodisc display instructions
- Sound track instructions

After you compile the DRAW forms into a display library, you transfer the library to the PRO-350 along with the DESIGN pseudo-code files.

---

## Sample Applications with IVIS

### Components of a Completed IVIS Course

A completed IVIS course runs on the PRO-350 with the IVIS option, a videodisc player, and a memory unit containing DESIGN pseudo-code and DRAW libraries. The major components of a completed IVIS course are:

- The videodisc—contains motion video sequences, still frames, and two sound tracks, which you can select individually. The DRAW graphics editor lets you generate text and graphic displays that you can overlay on video images to highlight details. In addition, DRAW .IVIS commands let you control the videodisc player from DRAW forms.
- The DRAW library—contains the DRAW forms. These forms can contain text, graphics, and control instructions for the video player.
- DESIGN program—in the form of pseudo-code files. The program controls output from the DRAW library and handles interaction between a user and the system.

The following sections provide sample applications that show how to control the videodisc player from DRAW forms. In addition, you will learn how to overlay text on top of a video image.

## Using DRAW Forms to Control the Videodisc Player

The videodisc player is controlled by DRAW forms that you create. You can control the player in the following ways:

- Play from A to B, where A and B are frame numbers in the range 1 to 54000.
- Display still frames.
- Turn audio tracks 1 and 2 on or off.
- Vary playing speed, depending on the brand of player available.

Each side of a videodisc contains 54000 frames. The videodisc can output up to 30 minutes of continuous video sequences.

The disc also contains two audio tracks. When controlling audio, you can play video and track 1 together, and use track 2 as a commentary for a nonvideo portion of the course. For example, a DRAW form can contain instructions to play from frame 2000 to 3000 with video and audio track 1 off, and audio track 2 on. You can further specify graphics associated with audio track 2 within the DRAW form.

## Sample Storyboard Frames with IVIS

The following sections show you how to create DRAW forms that control a videodisc player, based on the sample storyboard frames shown in Figures 5-1 and 5-3.

### Getting Started

You develop the forms that follow on a PRO-350 terminal. Because these forms are used for an IVIS course, create the DRAW display library as follows:

**LIBRARY/CREATE/IVIS NEW**

This command creates the DRAW display library. In addition, DRAW plots DLBSTART.FR, which clears special features and sets the default color map. Use the /IVIS switch when you create a display library to use in an IVIS course.

After you create the library, you must set a switch to pass .IVIS commands to the videodisc software. To do so, enter:

**SET /IVIS**

This form of the **SET** command sets IVIS mode and causes the videodisc software to interpret and execute all succeeding .IVIS commands.

To start the videodisc player, enter these commands:

## Sample Applications with IVIS

This example combines in the same form, DRAW commands that control the videodisc player and display text on your screen.

You can save these commands and compile them into the library using the form name "STARTUP". After you do, you can initialize the videodisc player at any time by entering:

```
.PLOT STARTUP
```

The following sections describe .IVIS commands in more detail. Refer to Chapter 6 for complete descriptions of all .IVIS commands.

### Playing a Videodisc Sequence

Figure 5-1 shows a storyboard frame that specifies a videodisc play sequence with overlaid text.

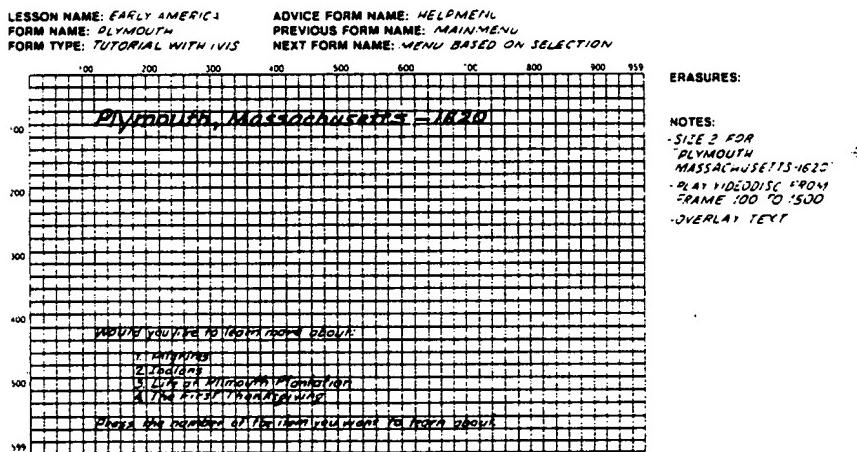


Figure 5-1: Sample Storyboard Frame for a Videodisc Play Sequence

## Sample Applications with IVIS

You use .IVIS commands to control the videodisc player from DRAW forms. This section shows how to use several .IVIS commands to play a videodisc sequence.

To begin developing the sample application, enter:

```
.AT (100,75,SIZE=2) Plymouth, Massachusetts - 1620
```

This command displays "Plymouth, Massachusetts - 1620" in size 2 near the top of your screen.

To play both a video and an audio sequence, enter these commands:

```
.SCREEN COLOR=DARK  
.IVIS FIND 100  
.IVIS AUDIO 1 ON  
.IVIS MODE MIXED  
.IVIS PLAY FROM 100 TO 1500  
.IVIS WAIT
```

.SCREEN COLOR=DARK defines the entire screen as a video port, letting you see videodisc sequences. The .IVIS commands control the videodisc player:

.IVIS FIND 100	finds frame 100 on the videodisc.
.IVIS AUDIO 1 ON	turns on audio track 1.
.IVIS MODE MIXED	sets the state of the IVIS interface, letting you overlay graphics on top of the videodisc image.
.IVIS PLAY FROM 100 TO 1500	plays a video and audio sequence beginning at frame 100 and ending at frame 1500.
.IVIS WAIT	waits for previous .IVIS commands to finish executing before additional DRAW graphic commands or .IVIS commands execute.

## Sample Applications with IVIS

After the video sequence plays, you can overlay additional graphics, because the .IVIS MODE MIXED command is still in effect. For example:

```
.AT <100,300> Would you like to learn more about:  
.AT <150,325> 1. Pilgrims  
.AT <150,350> 2. Indians  
.AT <150,375> 3. Life at Plymouth Plantation  
.AT <150,400> 4. The First Thanksgiving  
.TEXT PORT <100,425,60>  
Press the number of the item you want to learn about.  
.END TEXT
```

These commands overlay text on the video image. Based on the number the user types, the DESIGN program specifies DRAW forms that route the user to another section of the IVIS course. Figure 5-2 shows the finished screen display without accompanying video.

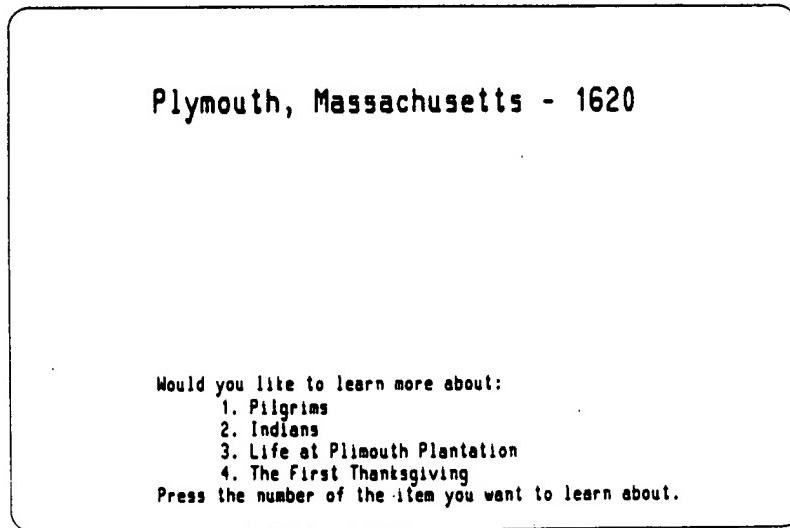


Figure 5-2: Screen Display for First Sample IVIS Application

### Displaying a Videodisc Still Frame

Figure 5-3 shows a storyboard frame that specifies a videodisc still display and DRAW menu.

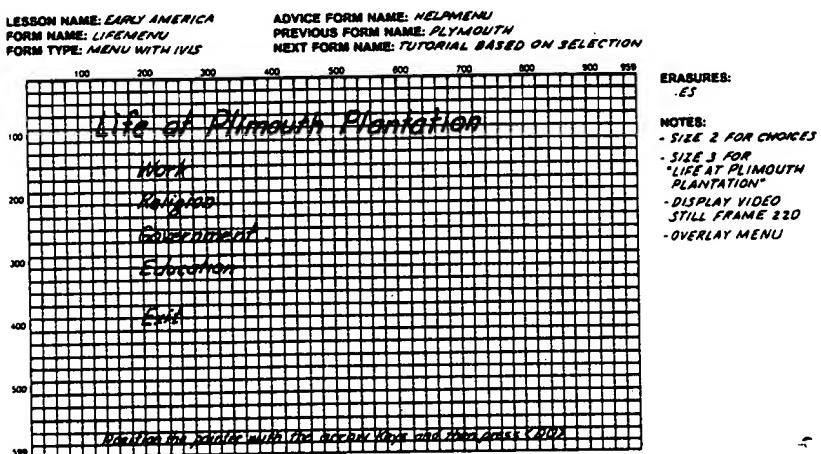


Figure 5-3: Sample Storyboard Frame for Videodisc Still Display

To create this sample screen display, first enter:

```
.ERASE SCREEN  
.IVIS FIND 220  
.IVIS MODE DISC  
.WRITE TIME=5
```

## Sample Applications with IVIS

These commands erase the screen and then find frame 220 on the videodisc. .IVIS MODE DISC sets the IVIS interface to DISC mode. In DISC mode only video is displayed; frame 220 appears on the screen. The .WRITE command specifies a time delay of five seconds before subsequent commands execute.

Now to display the menu, enter:

```
.IVIS MODE BLANKED
.CENTER (384,05,SIZE=3) Life at Plymouth Plantation
.MENU "-->" (100,100)
.CHOICE "MOD1" (200,100,SIZE=2) Work
.CHOICE "MOD2" (200,150,SIZE=2) Religion
.CHOICE "MOD3" (200,200,SIZE=2) Government
.CHOICE "MOD4" (200,250,SIZE=2) Education
.CHOICE "EXIT" (200,350,SIZE=2) Exit
.END MENU
.TEXT PORT (100,425,60)
Position the pointer with the arrow keys and then press <DO>.
.END TEXT
```

.IVIS MODE BLANKED resets the IVIS interface to BLANKED mode. In BLANKED mode only graphics are displayed; videodisc sequences are not displayed. The remaining DRAW commands display a menu on the screen and tell the user how to make a choice.

The second application is now complete. Figure 5-4 shows the finished screen display.

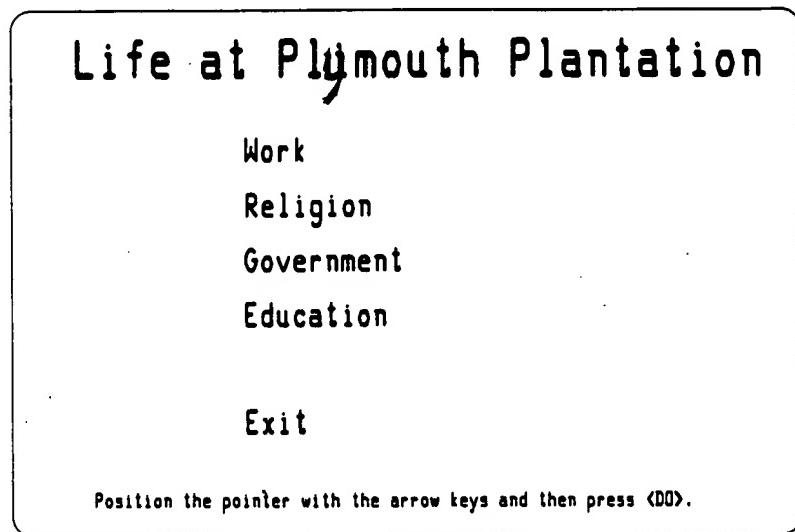


Figure 5-4: Screen Display for Second Sample IVIS Application

## Sample Applications with IVIS

### **Creating Video Ports**

A video port is a window through which you display video frames from the video disc. To create a video port for the entire screen, set the screen color to dark or create a block on the screen using the dark color attribute. For example:

```
.SCREEN COLOR=DARK
```

or

```
.BLOCK (0,0) (959,599,COLOR=DARK)
```

These commands define the entire screen as a video port.

To create a video port for a partial area of the screen, create a block over the screen area using the dark color attribute. For example:

```
.BLOCK (100,150) (300,400,COLOR=DARK)
```

This command creates a partial video port using a rectangular portion of the screen.

You can also use shapes other than rectangles for video ports. For example:

```
.CIRCLE (300,250) (200,250,COLOR=DARK)
```

This command creates a partial video port using a circular portion of the screen.

AA-AT31A-TE

# VAX Producer

---

Computer-Based  
Instruction  
Student Guide

Digital Equipment Corporation

---

First Edition, November 1983

© Digital Equipment Corporation 1983. All Rights Reserved.

The information in this document is subject to change without notice and should not be construed as a commitment by Digital Equipment Corporation. Digital Equipment Corporation assumes no responsibility for any errors that may appear in this document.

The software described in this document is furnished under a license and may only be used or copied in accordance with the terms of such license.

No responsibility is assumed for the use or reliability of software on equipment that is not supplied by DIGITAL or its affiliated companies.

The following are trademarks of Digital Equipment Corporation:

**digital**  
DEC  
Professional 350  
VAX  
VMS  
VT

Printed in U.S.A.

---

## **CONTENTS**

### **INTRODUCTION 1**

Purpose of Student Guide 1  
Computer-Based Instruction 1

### **COURSE STRUCTURE 2**

Section 1. Overview 2  
Section 2. VAX DRAW 2  
Section 3. VAX DESIGN 3  
Section 4. Integration 3

### **SECTION AND MODULE DESCRIPTIONS 4**

Section 1. Overview 4  
Section 2. VAX DRAW 4  
Section 3. VAX DESIGN 5  
Section 4. Integration 6

### **OBTAINING HELP 7**

### **HOW TO GET STARTED 9**

Contents

**HOW TO EXIT THE COURSE 9**

**INDEX OF COMMANDS 10**

VAX DRAW Graphic Commands 10  
VAX DRAW Editing Commands 11  
Non-graphics Terminal Attributes 12  
DCL Commands 12  
VAX DESIGN Statements 12  
VAX DESIGN Functions 14  
DESIGN Display Attributes 14  
DCL Commands 14

## **INTRODUCTION**

### **Purpose of Student Guide**

This student guide prepares you to take the computer-based course, "Introduction to the VAX PRODUCER." The guide outlines the course structure, provides an overview of each module, and explains how to begin and end the course.

The guide also serves as a reference when you want to use the special help features contained in the course, and when you want to locate specific commands within the course.

### **Computer-Based Instruction**

You are going to take this course using Computer-Based Instruction (CBI). In CBI, the computer presents instructional material and evaluates students' responses. You can choose what you want to learn about and proceed through the course at your own rate.

## COURSE STRUCTURE

"Introduction to the VAX PRODUCER" consists of four sections: Overview, VAX DRAW, VAX DESIGN, and Integration. Each section contains one or more modules of related lessons.

### Section 1. Overview

#### **Module 1.1     Do This First**

- Lesson 1.1.1    Introduction to CBI
- Lesson 1.1.2    Overview of the VAX PRODUCER
- Lesson 1.1.3    DRAW Demonstration

### Section 2. VAX DRAW

#### **Module 2.1     Fundamentals**

- Lesson 2.1.1    Entering and Leaving DRAW
- Lesson 2.1.2    Text Ports
- Lesson 2.1.3    Text Blocks
- Lesson 2.1.4    Editing Text
- Lesson 2.1.5    DRAW Help

#### **Module 2.2     Text Enhancers**

- Lesson 2.2.1    Attributes
- Lesson 2.2.2    Text Sizing

#### **Module 2.3     Graphics and Animation**

- Lesson 2.3.1    Lines, Boxes, and Blocks
- Lesson 2.3.2    Animation
- Lesson 2.3.3    Graphics

#### **Module 2.4     Connecting Forms**

- Lesson 2.4.1    Erasures
- Lesson 2.4.2    Sequential Plotting

---

## Computer-Based Instruction Student Guide

---

**Module 2.5 Putting DRAW to Work**

Lesson 2.5.1 Form Names and Locations

Lesson 2.5.2 The DRAW Environment

### **Section 3. VAX DESIGN**

**Module 3.1 A Simple Program**

Lesson 3.1.1 A Program Segment

Lesson 3.1.2 Required Programming

Lesson 3.1.3 Program Execution

**Module 3.2 Interactive Programs**

Lesson 3.2.1 Input and Response Judging

Lesson 3.2.2 More Response Judging

**Module 3.3 Structured Programming**

Lesson 3.3.1 Units

Lesson 3.3.2 Nesting and Scope

Lesson 3.3.3 Units with Parameters

Lesson 3.3.4 Flow Control

**Module 3.4 Advanced Techniques**

Lesson 3.4.1 Exception Handlers

Lesson 3.4.2 Backing Up

### **Section 4. Integration**

**Module 4.1 VAX DRAW and VAX DESIGN**

Lesson 4.1.1 Overlays, Erasures, and Back Ups

Lesson 4.1.2 More on Menus

Lesson 4.1.3 Response and Feedback Windows

## SECTION AND MODULE DESCRIPTIONS

### Section 1. Overview

#### Module 1.1 Do This First

This section serves as an overview to the course and to the VAX PRODUCER System. An introduction explains how to take the course, and a map is presented to show the course structure. Movement through the course using menus and the special help feature will be explained. An overview of the product describes the VAX DRAW Graphics Editor and the VAX DESIGN Language, and how they are used. A DRAW demonstration shows the fundamental functions and capabilities of VAX DRAW on a non-graphics terminal.

### Section 2. VAX DRAW

#### Module 2.1 Fundamentals

In this module the student learns to enter and leave the DRAW workspace. Task-oriented instruction leads the user through the process of typing in basic DRAW commands. The use of various editing techniques and how to access Help from DRAW are presented.

#### Module 2.2 Text Enhancers

This module presents commands to enhance text and graphics. Text sizing and attributes such as bold, blink, and reverse are explained. The user has the opportunity to enter commands and watch them work.

#### Module 2.3 Graphics and Animation

This module explains and demonstrates uses of boxes, lines, and blocks. In addition, techniques for creating graphics and dynamic screen displays through the use of animation are explored.

---

## **Computer-Based Instruction Student Guide**

---

### **Module 2.4 Connecting Forms**

The user learns to utilize various erasure commands that permit the plotting of a sequence of displays. Methods for editing and viewing series of displays are practiced.

### **Module 2.5 Putting DRAW to Work**

This module prepares the student for setting up a working DRAW environment. The creation of directories, files, forms and libraries are discussed.

## **Section 3. VAX DESIGN**

### **Module 3.1 A Simple Program**

In this module the student learns to write a simple linear program in the VAX DESIGN Language that displays DRAW forms, and prints text on the terminal screen. The process of preprocessing, linking and running a program is covered.

### **Module 3.2 Interactive Programs**

Several program segments are created that accept and judge user input. Programs that accept multiple correct answers and make use of menu functionality are presented.

### **Module 3.3 Structured Programming**

The concept of structured programming is introduced in this module. The principles of nesting, scope, block structure, control flow, and parameters in the DESIGN language are explained.

### **Module 3.4 Advanced Programming Techniques**

The last module of the VAX DESIGN section of the course covers exception handlers and techniques for backing up in a program.

---

**Computer-Based Instruction Student Guide**

---

**Section 4. Integration**

**Module 4.1 VAX DRAW and VAX DESIGN**

The last section of the course provides a bridge between the VAX DRAW and VAX DESIGN sections of the course. The various functions and commands in DRAW and DESIGN that depend upon each other or have similar functionality will be outlined.

---

---

**Order No. AA-AK73A-TE**

# **VAX DESIGN<sup>USER'S</sup> GUIDE**

---

**December 1983**

This manual introduces the VAX DESIGN authoring language for developing computer based instruction (CBI) and informational applications. Created on VAX/VMS, DESIGN applications run on a variety of DIGITAL operating systems.

**Operating System and Version:** VAX/VMS V3.4

**Software Version:** VAX DESIGN V1.0

**Digital Equipment Corporation**

The information in this document is subject to change without notice and should not be construed as a commitment by Digital Equipment Corporation. Digital Equipment Corporation assumes no responsibility for any errors that may appear in this document.

The software described in this document is furnished under a license and may be used or copied only in accordance with the terms of such license.

No responsibility is assumed for the use or reliability of software on equipment that is not supplied by DIGITAL or its affiliated companies.

Copyright (c) 1983 by Digital Equipment Corporation. All rights reserved.

The postage-paid READER'S COMMENTS form on the last page of this document requests your critical evaluation to assist us in preparing future documentation.

The following are trademarks of Digital Equipment Corporation:

	Digital	RSX
ALL-IN-1	IVIS	Tool Kit
DEC	MASSBUS	UNIBUS
DECmate	MICRO/PDP-11	VAX
DECnet	PDP	VMS
DECsystem-10	P/OS	VT
DECSYSTEM-20	Professional 300	Work Processor
DECUS	Rainbow 100	
DECwriter	RSTS	

Printed in U.S.A.

---

# **Contents**

## **Preface**

Manual Objectives	vi
Audience	vi
Manual Structure	vii
Related Documents	vii
Conventions	viii

## **Chapter 1. Overview of the DESIGN**

### **Authoring Language 1-1**

Language Features	1-1
Language Elements	1-2
Program Execution	1-7
DESIGN Command Line Features	1-13

## **Chapter 2. Planning VAX DESIGN CBI Courses 2-1**

Designing the CBI Course	2-4
Producing the Storyboard	2-5
Creating the DRAW Forms	2-6
Creating the Lesson Flowcharts	2-11

---

## **Contents**

---

### **Chapter 3. Programming the DESIGN Application 3-1**

Using the Lesson Flowchart to Write a Lesson Segment 3-2  
Sequencing and Displaying Information to the Student 3-3  
Eliciting Student Responses: Menu Choices 3-4  
Evaluating Student Responses 3-6  
Macros 3-14

### **Chapter 4. Evaluating Student Responses 4-1**

The MATCH Statement LINE Input Option 4-2  
The BACKUP Statement 4-8  
The TRIES Function, and MAXTRIES 4-11  
MAXTRIES 4-12  
The RESPONSE and TERMINATOR Functions 4-12  
Exception Handling 4-14

### **Chapter 5. Using External Programs 5-1**

The CALL EXTERNAL Statement 5-2  
Single-call Subroutines 5-3  
Multiple-Call Subroutines 5-3  
Examples of Interprocess Communication 5-4  
Argument Type and Number Agreement 5-7  
Black Box Object Libraries 5-7

### **Chapter 6. Building a DESIGN-based Application on the PRO-350 6-1**

Preparing to Create a Professional 350 Application 6-2  
Creating the Application Installation (.INS) File 6-5  
Creating the Professional 350 Application 6-10  
Summary of the Installation Procedure 6-12

### **Chapter 7. DESIGN Sample Program 7-1**

Draw Forms Used in Sample Program 7-13

---

## Contents

---

### **Appendix A Design Preprocessor Error Messages A-1**

Severity level: FATAL A-1  
Severity level: ERROR A-5  
Severity level: WARNING A-14  
Severity level: INFORMATION A-16

### **Glossary G-1**

#### **Figures**

- Figure 2-1: The DESIGN Course Development Process 2-2  
Figure 2-2: Sample Storyboard 2-6  
Figure 2-3: Screen Display for a Sample Form 2-9  
Figure 2-4: Sample Lesson Flowchart 2-12  
Figure 3-1: Menu Display 3-4  
Figure 6-1: Sample .INS File 6-9

#### **Tables**

- Table 1-1: Summary of DESIGN Preprocessor Switches 1-11

---

## Preface

### **Manual Objectives**

This manual explains how to use features of the VAX DESIGN Authoring Language to write computer-based instruction (CBI) and informational applications.

### **Audience**

The audience is the application-level programmer or course developer who is familiar with the VAX/VMS operating system, its file utilities, and one of its editors.

---

## Preface

---

### Manual Structure

This manual is divided into seven chapters, a glossary, an appendix on preprocessor error messages, and an index:

Chapter 1	provides an overview of the DESIGN authoring language and its use.
Chapter 2	explains how to plan a DESIGN application.
Chapter 3	explains how to code a DESIGN application.
Chapter 4	describes some of the options for evaluating and responding to student answers.
Chapter 5	describes the use of external programs.
Chapter 6	describes how to build a DESIGN-based application on the Professional 350 computer.
Chapter 7	contains the source code of a sample DESIGN program.
Appendix A	explains the DESIGN preprocessor error messages.
Glossary	defines terms used in authoring computer-based instruction.

### Related Documents

The *DESIGN Authoring Language Reference Manual* provides a complete description of the elements and structure of the DESIGN language.

The *DRAW User's Guide* describes how to use the DRAW graphics editor to create and store display libraries. This manual includes the commands you use to control the videodisc player(s) in an IVIS application.

The booklet entitled *Introduction to Computer-Based Education* presents an overview of the course development process (Digital Equipment Corporation publication number EB-25005-87).

If you are installing a DESIGN course as an IVIS application on a PC350, then you should also refer to the *PC350/IVIS Device Driver Reference Manual*.

### Conventions

< > (angle brackets)	enclose a DESIGN entity you must name. For example, the UNIT statement is defined as: UNIT <unit_name>.
<RET>	This symbol indicates the RETURN key.
CTRL/x	The symbol tells you to press the CTRL (control) key and a letter key at the same time. For example, to erase any display on your screen from the current cursor position to the beginning of that line, you press:  CTRL/U
...	A horizontal ellipsis indicates that the preceding item can be repeated.
...	A vertical ellipsis means that not all the statements in a figure or example are shown.
[ ]	Square brackets enclose optional elements of syntax.
RED	Red print in the examples shows what you type.

Order No. AA-AK71A-TE

# VAX DESIGN Language Reference Manual

October 1983

This manual describes the VAX DESIGN authoring language for creating computer based instruction and computer based information on a VAX/VMS system for subsequent use on VMS and other operating systems.

Operating System and Version: VAX/VMS V3.4

Software Version: 1.0

Digital Equipment Corporation

The information in this document is subject to change without notice and should not be construed as a commitment by Digital Equipment Corporation. Digital Equipment Corporation assumes no responsibility for any errors that may appear in this document.

The software described in this document is furnished under a license and may be used or copied only in accordance with the terms of such license.

No responsibility is assumed for the use or reliability of software on equipment that is not supplied by DIGITAL or its affiliated companies.

Copyright (c) 1983 by Digital Equipment Corporation. All rights reserved.

The postage-paid READER'S COMMENTS form on the last page of this document requests your critical evaluation to assist us in preparing future documentation.

The following are trademarks of Digital Equipment Corporation:

<b>DIGITAL</b>	Digital	RSX
ALL-IN-1	IVIS	Tool Kit
DEC	MASSBUS	UNIBUS
DECmate	MICRO/PDP-11	VAX
DECnet	PDP	VMS
DECsystem-10	P/OS	VT
DECSYSTEM-20	Professional 300	Work Processor
DECUS	Rainbow 100	
DECwriter	RSTS	

Printed in U.S.A.

---

# Contents

## Chapter 1. Overview of the DESIGN Language

Language Elements	1-2
Compound Statements	1-4
Units	1-5
Unit Parameters	1-5
Nesting Units	1-5
Executing Units	1-6
Scope of Units	1-6
Variables	1-8
Variable Identifiers	1-8
Arrays	1-9
Scope of Variables	1-9
Assigning Values to Variables	1-9
Constants	1-10
Expressions	1-11
Operands	1-11
Operators	1-11
Precedence of Operations	1-12
Data Types in Expressions	1-13
Type Conversion	1-14

## **Contents**

---

### **Chapter 2. Handling Screen Displays**

Creating Forms Using DRAW 2-2  
Display Libraries 2-2  
    Accessing Display Libraries 2-3  
    Displaying Forms 2-4  
Displaying Messages on the Screen 2-5  
Screen Display Windows 2-6  
    The Response Window 2-6  
    The Feedback Window 2-7  
Erasing the Screen or its Windows 2-8  
Frames 2-8  
    Backing Up to a Previous Frame Marker 2-9  
    Setting Up a Frame "Fence" 2-9  
    Examples of Frame Usage 2-10

### **Chapter 3. Input and Response Evaluation**

Input Options 3-2  
    CHARS 3-2  
    LINE 3-3  
    MENU 3-3  
Rematching 3-4  
Unevaluated Input 3-4

### **Chapter 4. Error Processing**

Error Exceptions 4-2  
    Error Exception Severity 4-2  
    Defining an Exception Handler 4-3  
    Using Exception Parameters 4-3  
        Resuming Processing After an Exception 4-4  
    Signaling Exceptions 4-5  
    Nesting Active Exceptions 4-6  
    User-Defined Exceptions 4-6  
    Disabling Exceptions 4-7  
    Enabling Exceptions 4-7  
    Handling Mismatches 4-7

## Contents

Input Exceptions 4-8  
    Scope of Input Exceptions 4-10  
    Input Exceptions and the INPUT Statement 4-10  
    Disabling Input Exceptions 4-11  
    Enabling Input Exceptions 4-13  
    Match, Input Exceptions, and MISMATCH 4-13

### **Chapter 5. Flow Control**

    Conditional Execution 5-1  
    Selectable Branching 5-2  
    Looping 5-3  
    Non-Structured Flow Control 5-3  
    Exiting from a Unit 5-4  
    Stopping Execution 5-4  
    Chaining Units Together 5-4

### **Chapter 6. File Handling**

    File I/O Statements 6-1  
    Default File Extensions 6-2

### **Chapter 7. Runtime Functions and Subroutines**

    Built-In Functions 7-1  
    Runtime Library Routines 7-2  
    EXPAND\_DAYTIME 7-2  
    External Subroutines: Interprocess Communication 7-3

### **Chapter 8. Preprocessor Directives**

    MACROS - %MACRO Directive 8-1  
    Including Text - %INCLUDE Directive 8-4  
    Declaring a Text Library - %TEXT\_LIBRARY Directive 8-5  
    Listing Control - %LIST Directive 8-6

---

## Contents

---

### Chapter 9. DESIGN Statements

BACKUP Statement 9-5  
BRANCH Statement 9-8  
CALL Statement 9-9  
CHAIN Statement 9-10  
CLOSE Statement 9-11  
CONSTANT Statement 9-12  
CONTINUE Statement 9-14  
DEFINE Statement 9-15  
DISABLE Statement 9-17  
DO Statement 9-20  
ENABLE Statement 9-22  
ERASE Statement 9-23  
EXIT Statement 9-24  
EXITLOOP Statement 9-25  
FEEDBACK Statement 9-26  
FOR Statement 9-28  
GET Statement 9-30  
IF-THEN-ELSE Statement 9-32  
INPUT Statement 9-33  
    INPUT CHARS Statement 9-34  
    INPUT LINE Statement 9-36  
    INPUT MENU Statement 9-38  
MARK Statement 9-40  
MATCH Statement 9-42  
    MATCH CHARS Statement 9-44  
    MATCH LINE Statement 9-46  
MATCH MENU Statement 9-48  
MOVE Statement 9-50  
ON Statement 9-51  
OPEN Statement 9-54  
OUTPUT/OUTPUTL Statement 9-56  
PLOT Statement 9-58  
READ Statement 9-60  
RESUME Statement 9-61  
REWIND Statement 9-63  
SELECT Statement 9-64

## Contents

SET Statement 9-66  
SET CASE SENSITIVE 9-68  
SET COORDINATES 9-69  
SET DEFAULT LIBRARY 9-71  
SET ECHO 9-72  
SET ERASE FEEDBACK 9-73  
SET ERASE RESPONSE 9-74  
SET FEEDBACK WINDOW 9-75  
SET KEY ECHO 9-77  
SET KEY OUTPUT 9-79  
SET KEY TERMINATOR 9-81  
SET KEYPAD 9-83  
SET MAXTRIES 9-84  
SET PROMPT 9-85  
SET RANDOMIZE 9-86  
SET RESPONSE WINDOW 9-87  
SET SCREEN 9-89  
SET SPEED 9-91  
SET TERMINALMODE 9-92  
SET TIMEOUT 9-93  
SET UPCASE 9-94  
SIGNAL Statement 9-95  
STOP Statement 9-97  
UNIT Statement 9-98  
UNTIL Statement 9-100  
WAIT Statement 9-101  
WHILE Statement 9-102  
WRITE Statement 9-104

## **Chapter 10. DESIGN Functions**

ASCII Function 10-1  
BOOLEAN Function 10-2  
DOUBLE Function 10-3  
FILENAME Function 10-4  
FIND Function 10-4  
FLOAT Function 10-5  
INTEGER Function 10-6  
LAST\_FORM\_PLOTTED Function 10-7  
LEFT Function 10-7  
LENGTH Function 10-8

## **Contents**

---

LOWER Function 10-8  
RAND Function 10-9  
RESPONSE Function 10-9  
RIGHT Function 10-10  
SEVERITY Function 10-10  
STRING Function 10-11  
SUBSTRING Function 10-14  
SYSDATE Function 10-14  
SYSDAYTIME Function 10-15  
SYSTIME Function 10-15  
TERMINAL\_TYPE Function 10-16  
TERMINATOR Function 10-16  
TRIES Function 10-17  
UPPER Function 10-18

### **Appendix A. PRODUCER Interpreter Exceptions**

SEVERITY LEVEL: FATAL A-1  
SEVERITY LEVEL: ERROR A-6  
SEVERITY LEVEL: WARN A-15  
SEVERITY LEVEL: INFO A-16

### **Appendix B. Function Keys and Screen Attributes**

Function Keys B-1  
CONTROL CHARACTERS B-2  
ARROW KEYS B-2  
NUMERIC KEYPAD B-3  
LK200 FUNCTION KEYS B-4  
Display Attributes B-5

### **Appendix C. Backus-Naur Format (BNF) Specification for Design**

---

## Preface

### **Manual Objectives**

This manual provides complete reference information for the VAX DESIGN authoring language.

### **Audience**

The audience for the *VAX DESIGN Language Reference Manual* is an applications-level programmer or course developer who is familiar with the VAX/VMS operating system, its file utilities, and at least one of its editors.

### **Manual Structure**

- |                |  |
|----------------|--|
| Chapters 1 - 8 | provide an overview of the DESIGN language and its components.                         |
| Chapter 9      | provides individual descriptions of all language statements in alphabetical order, and |
| Chapter 10     | provides individual descriptions of all language-supplied functions.                   |

## Preface

- |            |   |
|------------|---|
| Appendix A | lists language exceptions.  |
| Appendix B | lists function keys and screen attributes.                                |
| Appendix C | contains a Backus-Naur Format (BNF) specification of the DESIGN language. |

## Related Documents

You can find additional information related to the DESIGN authoring language in the following documents:

- *VAX DESIGN User's Guide*
- *VAX DRAW User's Guide*
- *VAX PRODUCER Pocket Reference Guide*

## Conventions

This manual uses the following conventions:

- |           |  |
|-----------|--|
| CTRL/x    | The phrase CTRL/x indicates that you should press the CTRL key on your terminal while you simultaneously press the key identified by x.          |
| []        | Square brackets enclose optional elements of syntax.   |
| {}        | Braces enclose options from which you must choose one and only one alternative. Choices enclosed within braces are delimited by choice bars () . |
| ...       | Ellipses indicate that the preceding item can be repeated.   |
| UPPERCASE | Uppercase printing in syntax formats indicates that a keyword that you must type as shown.   |
| lowercase | Lowercase printing in syntax formats indicates a clause, statement, name, or value that you supply.  |

# DIGITAL'S LA50 PERSONAL PRINTER.

• The perfect companion to your personal computer or video workstation.

- A small low priced printer, with features that make it act more expensive than it really is.

**digital**

This is a sample of logic terminal output. Notice the true descenders and the underline capability. And this is a sample of LA50 Enhanced single pass printing. Notice the high quality, true descenders, and underlines.

Even printers that cost a lot more can't do more than this remarkable new Personal Printer.

You can see how crisp and clear its printing is, just by looking at the sample. Notice the true descenders, and the underlining. The Enhanced Single Pass Mode capability is available at the command of the host. The Personal Printer speeds through your work bidirectionally at 100 characters per second.

It also features both standard adjustable-width tractors and friction feed, so you can easily use continuous forms or single sheet paper (such as letterhead). With either method, you can print an original, and two copies as well.

You can change printing pitches from 10 characters per inch to 12 and even print a compressed font of 16½ per inch that fits 132 columns onto a 8½ wide sheet of paper; print in boldface. You can replace the printhead yourself, without fuss, and the Personal Printer uses inexpensive cartridge ribbons.

Above all, the Personal Printer was designed to work with Digital's computers. That means it can do everything its host tells it to, including full bit map graphics printing. (That's more than you can say for some other printers!)

The Personal Printer is compact and user-friendly. It is part of the family of printers offered by Digital. It's fully supported by Digital's Terminals Distributors and Digital's 16,000 service professionals worldwide who stand ready if help is needed.

All of which makes it the perfect printer to go with your personal computer. Or your video workstation.

# DIGITAL'S LA50 PERSONAL PRINTER.

A FEW LA50  
FEATURES  
THAT MAKE IT  
ACT MORE  
EXPENSIVE  
THAN IT IS.

THE  
PERFECT  
COMPANION  
TO YOUR  
PERSONAL  
COMPUTER.  
  
THIS IS  
DIGITAL'S  
LOWEST  
PRICED  
PRINTER.

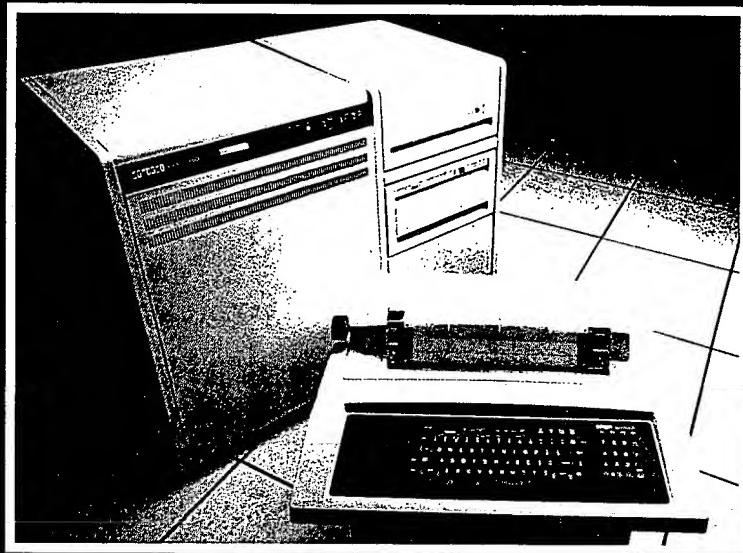
PRINTED IN USA ED-231B5-56/82 050 100.0 (c) COPYRIGHT 1982 DIGITAL EQUIPMENT CORPORATION. ALL RIGHTS RESERVED

100 CPS Bidirectional Logic Seeking printing  
7x9 character cell with true descenders and  
underlining  
96 ASCII character set, with 8-bit multilingual set  
also standard  
10 or 12 CPI variable pitches  
16.5 CPI compressed font for 132-column printing  
Double width 5, 6 or 8.25 CPI for bold printing  
Enhanced Single Pass Mode for higher print quality  
Friction feed or variable width tractors (4½" to 10")  
Programmable top of form, page length  
6 lpi, 8 lpi vertical spacing  
RS232C Serial line interface  
1300 character buffer with XON/XOFF control  
110-4800 baud communications  
Size: 16" W x 4¾" H x 11½" D (40.6cm x 12.1cm  
x 28.6cm)  
Weight: 18.5 lbs (8.33kg)

digital



M



# VAX11 750

Computer System

digital

## DESCRIPTION

## CENTRAL PROCESSOR

The VAX-11/750 computer system is the mid-range, high-performance system that implements VAX Family architecture, thus making it software compatible with other VAX Family systems. User programs written for one VAX system can run without modification on any other VAX system. Data and software compatibility with PDP-11 computer systems is provided by utilization of the same disk or tape file formatting and through compatibility mode PDP-11 system instructions.

A variety of complete VAX-11/750 systems is available. Each system is based on the VAX-11/750 processor, the VAX/VMS operating system, a choice of mass storage subsystems, a console terminal, an 8-line communication multiplexer, and a minimum of one Mbyte of memory.

The Central Processing Unit (CPU) of the VAX-11/750 system is a micro-programmed computer that executes a large set of variable-length instructions in VAX native mode, and nonprivileged PDP-11 system instructions in compatibility mode.

### VAX Native Mode

The native-mode instruction set is highly versatile and bit-efficient, resulting in concise, fast-running programs. Each native mode instruction can use any of nine different addressing modes. This yields smaller programs and less complicated assembly language programming.

The processor has built-in floating-point instructions that handle single and double precision (32- and 64-bit) computation. Full decimal arithmetic and text string instructions equip the VAX-11/750 processor for commercial and character-oriented data processing applications. The native mode instruction set also includes program control and special instructions that improve both the performance and the memory utilization of system and application software. Instructions are variable in length and can start on any byte boundary.

### Compatibility Mode

In compatibility mode, the processor executes the user set of PDP-11 instructions, recognizes integer data, and uses eight 16-bit general purpose registers. This allows the VAX-11/750 system user to run most existing nonprivileged RSX-11M™ and RSX-11S operating system software, including compilers, utilities and user programs. Programs that use compatibility mode instructions can execute concurrently with native mode programs.

### Registers and Cache Memory

The processor provides sixteen 32-bit registers that can serve as temporary storage, accumulators, index registers, and base registers for user application programs.

The Memory Cache of the processor is a 4 Kbyte, direct-mapped, write-through cache. It reduces the effective CPU access time to memory to 400 nanoseconds with a 90% hit rate. The write-through feature protects the integrity of memory because memory contents are updated immediately after the processor performs a write.

The translation buffer of the processor contains 512 virtual-to-physical page address translations. This significantly reduces the time spent on virtual to physical address translation. An 8-byte instruction prefetch buffer improves processor performance by prefetching and decoding data in the instruction stream. The control logic fetches long-word data from memory to keep the 8-byte buffer full.

### Clocks

Two clocks are contained in the VAX-11/750 processor. The high-resolution, programmable, realtime clock is used by systems diagnostics and by the VAX/VMS operating system for accounting and scheduling. The time-of-year clock, with its own battery backup, is used by the operating system to enable unattended automatic restart following any service interruption, including a power failure.

A UNIBUS adapter supports general purpose options and devices. The maximum I/O rate through one of the three buffered data paths is 1.5 megabytes per second. This adapter has direct vectored interrupts. As much as five megabytes of data can be moved per second among the system's major hardware components. An optional second UNIBUS can be added.

Up to three optional MASSBUS adapters can be plugged into the basic VAX-11/750 processor. This allows connection for up to 24 MASSBUS disk or tape drives on a single processor. An individual MASSBUS adapter has a maximum I/O rate of two Mbytes per second.

The VAX-11/750 also supports the UDA50, a microprocessor based controller that provides performance optimization to improve disk throughput.

#### DMF32 Multifunction Communications Controller

The VAX-11/750 UNIBUS accepts a number of VAX/VMS supported device and communication controllers, including the DMF32 multifunction communications controller. The DMF32 consists of four controllers including: an 8-line asynchronous multiplexer featuring programmed DMA or silo transmit lines; a DMA synchronous line supported by DECnet communications software; and either a DMA lineprinter controller or a general purpose 16-bit DR11 parallel interface. The DMF32 is programmed for three interfaces to run concurrently: the asynchronous multiplexer, synchronous multiplexer, and LP or DR device.

VAX systems, designed for careful cooperation between hardware and software, perform continual checking, detecting, and correcting of error conditions. The result is a fault-tolerant environment where errors are corrected before they impede system operation. VAX maintenance operations, which are aided in part by the system's remote diagnosis capability, proceed quickly and easily when a failure does occur. Components are tested and repaired in minimal time, often without disturbing users or bringing the system down. Some of the VAX-11/750 dependability features are listed below.

- The operating system has powerfail recovery code; online system error logging; dynamic bad block handling; online functional diagnostics concurrent with user programs; and a User Environment Test Package (UETP).
- The CPU has ECC MOS Memory with a battery backup option; ability to turn off malfunctioning cache and continue to operate in degraded mode; CPU integrity diagnostic run during power up; VAX-11/750 processor board count is reduced to five modules (due to custom LSI technology); parity checking on MASSBUS data, cache, translation buffer, and CPU microcode; and single board options for MBA (MASSBUS Adapter) and UCS (User Control Store).

## SUPPORTED SOFTWARE

### Console Subsystem

The VAX-11/750 console subsystem is designed to allow the user to give commands interactively to the processor using the console command language. Three elements combine to give the user access to the system's capabilities: a set of machine status switches on the processor's front panel, the integral TU58 tape cartridge unit, and the console terminal. The DECwriter™ terminal serves as an operating system terminal for control and error logging, and as a system console. Additionally, the console terminal is a diagnostic console with the Remote Diagnostic Module (RDM) option. The TU58 tape cartridge unit may be used as a load device for diagnostics, optional software products, and software updates, as well as a convenient storage medium (up to 256 Kbytes) for personal data and programs.

The remote diagnosis module is an option available to customers with a full, DIGITAL maintenance contract. It provides the customer with dial-in diagnosis (24 hours a day, seven days a week, with a 15 minute response time), including detection of failures down to the board and chip level, and diagnostic capability even on an inoperative CPU.

### VAX/VMS Operating System

The VAX-11/750 system hardware is complemented by the high-performance VAX/VMS operating system. This operating system can support many user environments, including realtime processing, interactive program development, and batch processing, running independently, concurrently, or in any combination. It includes a highly efficient scheduling algorithm, extensive record and file management capabilities, and virtual memory features achieved by an extremely efficient paging algorithm.

V

imum

.04°F)

TU/h)

### Languages and Utilities

The VAX/VMS operating system offers a large choice of languages and utilities:

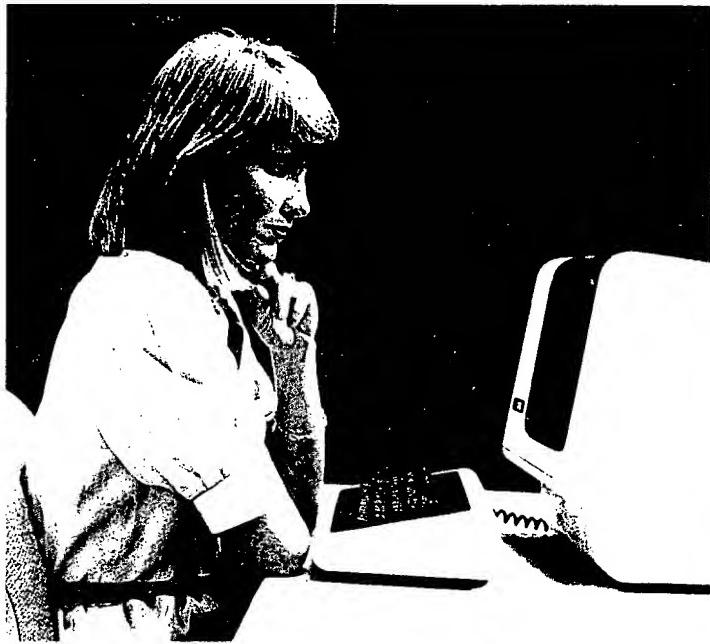
VAX-11 COBOL	VAX-11 DSM
VAX-11 FORTRAN	VAX-11 DATATRIEVE
VAX-11 BASIC	VAX-11 DBMS
VAX-11 PL/I	VAX-11 CDD
VAX-11 PASCAL	VAX-11 FMS
VAX-11 C	DECnet-VAX™
VAX-11 CORAL 66	MUX200/VAX
VAX-11 BLISS-32	VAX-11 2780/3780
VAX-11 MACRO	VAX-11 3271
VAX-11 DEC/CMS™	VAX-11 PSI
VAX-11 DIBOL™	

.11/750

The VAX/VMS operating system also provides program development and maintenance utilities including an interactive and a batch editor, a linker with cross-reference ability, and a symbolic debugger.

## HIGHLIGHTS

- 32-bit architecture with 4 gigabytes of virtual address space allowing for large programs without overlays
- Full VAX Instruction Set, including over 240 basic operations, nine addressing modes, six data types, and compatibility mode PDP-11™ instructions
- Sixteen 32-bit general purpose registers that can be used for temporary storage and as accumulators, index registers, and base registers
- A multiuser, multifunction virtual memory operating system that supports a wide variety of languages and program development tools
- Dependability through extensive reliability, availability and maintainability features including automatic error checking, remote diagnosis, VAX/VMS operating system on-line diagnostics, and automatic restart
- Advanced semiconductor technology implementation that reduces the physical size and power requirements, and increases reliability
- Expansion to eight Mbytes of ECC MOS Memory
- Direct memory access I/O for up to two UNIBUS or up to three MASSBUS (optional) adapters
- Hardware Bootstrap Load for up to 4 different devices
- High-speed intelligent parallel I/O option
- High-performance floating-point accelerator option



The VAX-11/750™ computer system is the mid-range member of the VAX family of computers. Like the VAX-11/780 it implements the full 32-bit VAX architecture, yet at a lower price. In addition to sharing the same set of system software with the VAX-11/780 and the VAX-11/730 systems, it also offers compatibility with the peripheral set via the UNIBUS™ and the optional MASSBUS™ adapters. The processor uses a 32-bit

architecture with addressing space for very large programs, an extensive instruction set with numerous data types, and 32-bit bus structure for high throughput.

The VAX-11/750 system hardware is complemented by the VAX/VMS™ (Virtual Memory System) operating system. This general purpose, multiprogramming operating system simultaneously handles multiuser, realtime, and multistream batch applications, plus online program development.

## SPECIFICATIONS

<b>Processor</b>			
Micro-control store instruction time	320 nanoseconds		
Control store size	6 Kwords (80-bit words, read only memory)		
Internal data path	32 bits		
Maximum system I/O rate	5 MB/s		
Instruction buffer size	8-byte lookahead		
Memory cache	4 KB direct mapped		
<b>VAX Instruction Set</b>			
16 32-bit registers			
248 basic operations			
56 optional instructions			
32 priority interrupt levels			
9 addressing modes			
Data types: Four integer types, four floating-point types, packed decimal, character string, variable bit fields, numeric strings			
<b>Main Memory</b>			
Virtual address space	4 gigabytes		
Physical expansion	8 megabytes in 1 Mbyte increments		
Parity	7-bit error correcting code per 32-bit longword		
Cycle times	800 nanoseconds per 32-bit read 640 nanoseconds per 32-bit write 400 nanoseconds effective with cache		
<b>I/O UNIBUS Adapter</b>			
Maximum UNIBUS I/O rate	1.5 MB/s through buffered data paths per UNIBUS		
Buffered data paths	3 total, 4-byte buffer in each per UNIBUS		

### POWER REQUIREMENTS\*

#### Maximum

AC line voltage tolerance 90–128 or 180–256 V

Frequency tolerance 47–63 Hz

Phases 1

Surge current 105 A

Maximum AC power consumption 1700 W

#### Physical Characteristics\*

Weight 182 kg (400 lbs) maximum

Height 106.2 cm (41.8 in)

Width 73.7 cm (29.0 in)

Depth 76.3 cm (30.0 in)

#### Operating Environment\*

Temperature 10° to 40°C (50° to 104°F)

Relative humidity 10 to 90%

Maximum altitude 2.4 km (8000 ft)

Heat dissipation 1460 kcal/h (5800 BTU/h)

\*NOTE: These specifications are given for the VAX-11/750 processor only.

The information in this document is subject to change without notice and should not be construed as a commitment by Digital Equipment Corporation. Digital Equipment Corporation assumes no responsibility for any errors which may appear in this document.

ORDER CODE: ED-23831-18

Printed in USA ED-23831-18/82 61 40  
1982 copyright Digital Equipment Corporation  
All rights reserved

**GTE**



**GTE Telenet**  
ADVANCING THE INFORMATION AGE



## THE INSTANT ELECTRONIC LINK

Getting information to the right place on time is the key to success in today's dynamically changing business environment. And traditional means of communication simply aren't enough. Consider the delays and inefficiencies associated with incompletely phone calls and slow moving mail.

Telemail,<sup>SM</sup> GTE Telenet's electronic communication service, is the instant link you need to field personnel, headquarters, customers, and other organizations. It can help you manage your business, save time, control expenses, and increase productivity. All you need is a data terminal and a telephone

to start taking advantage of the benefits of Telemail service.

As sophisticated as Telemail is, the basic capability it provides is simple. It lets you gather sales data, enter and verify orders, manage inventories, file reports, and distribute financial information throughout your company. Delivery is virtually instantaneous. Anywhere. Anytime.

Telemail is also a valuable inter-company communications tool, since it accommodates a wide variety of communications devices including TWX and Telex.

### Easy to use

Your business can start using Telemail right away. Regardless of your knowledge of data processing, you can learn Telemail's everyday business language and basic operating procedures in a few short sessions.

### Always available

Telemail is available virtually 24 hours a day, 7 days a week. Your business day is extended, and the problems of sending information between time zones are practically eliminated.

### Expandable

With Telemail, you can start small and expand as your needs grow. What's more important, no capital or upfront investment is required.

### Location independent

Access is available through the Telenet Public Data Network over dial-up lines from almost any location.

### Accessible worldwide

Telemail's compatibility with global communication standards allows you to access similar communications systems worldwide.



## PROVEN AND PRODUCING RESULTS

The Telemail service is a proven, effective means of exchanging information—the kind you might send in memos and letters. But Telemail is more than just a simple message system. Its specialized scripting capabilities allow you to format information to suit your particular business application.

No doubt much of the time-critical information in your organization appears in standardized forms and reports; for example, periodic cash reports, shipping confirmations, or sales orders. Telemail can replace most of your standard formats and can be easily adapted to your administrative functions.

In addition to facilitating intra- and inter-company communications, Telemail can be a cost-effective management tool. A number of industry groups are realizing the benefits of Telemail as a business communication system.

### *The Apothecary*



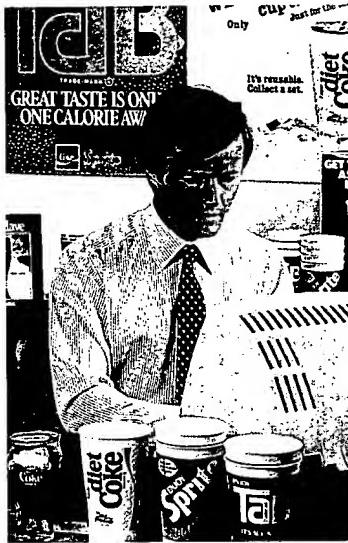
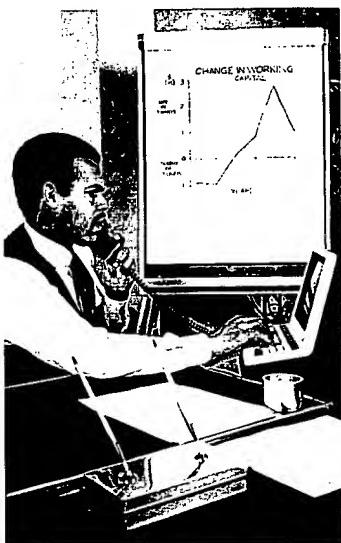
#### SALES/MARKETING

##### **Two-way communication between management and the field**

*"Using electronic mail, we get better information in less time, which has resulted in better management and marketing decisions." (a medium-sized sales and service firm)*

#### APPLICATIONS

- Remote order entry
- Product announcements
- Forecasting and market research
- Pricing information
- Travel provisions



## FINANCE

### Data collection and validation

*"With electronic mail's insensitivity to time barriers, plus its availability at any time, it offers an ideal solution." (a large communications company)*

### APPLICATIONS

- Payments and collections
- Market volume and share statistics
- Gathering financial information from dispersed locations
- Money management
- Report standardization

## OPERATIONS

### Increased manufacturing and distribution efficiency

*"Actual benefits included the generation of a hard copy order. Messages were not lost and deliveries of materials were more timely." (the world's largest soft drink manufacturer)*

### APPLICATIONS

- Inventory management
- Dispatching service calls
- Dissemination of product specifications
- Order processing

## ADMINISTRATION

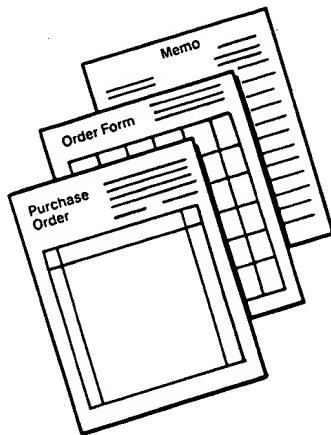
### Effective management and decision-making tool

*"Professional people initially were the most enthusiastic users...but now usage is migrating to middle management." (large diversified corporation combining utility, manufacturing operations, and service organizations)*

### APPLICATIONS

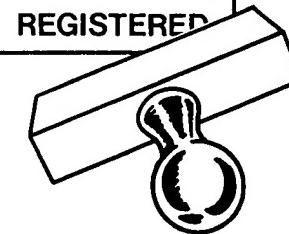
- Project reporting
- Authorization and delegation of duties
- Proposal development
- Issuing corporate guidelines and policies

## ADAPTING THE TELEMAIL SERVICE TO YOUR BUSINESS



### Customize forms, reports and orders

Telemail's "Inform Script" allows any type of printed information, standard memo, or multipart form to be sent instantly to one or a number of recipients. A validation capability helps eliminate inaccuracies.



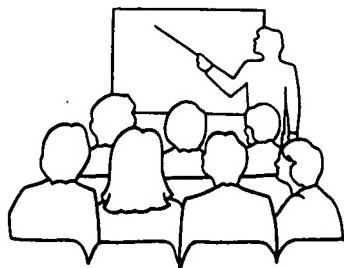
### Classify messages to ensure proper receipt

Messages may be sent routinely or specifically classified as URGENT, PRIVATE, REGISTERED, or TIMED DELIVERY.



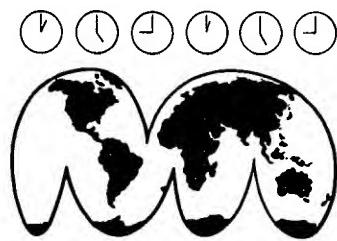
### Protect privacy and security

Telemail protects the confidentiality and security of sensitive business information by requiring the use of a unique password. A personal ID is also required to display messages marked "private."



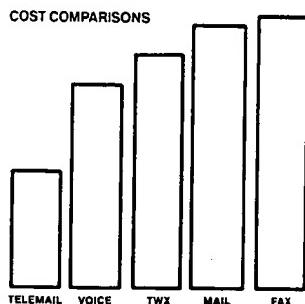
### Reach your entire audience at once

Electronic bulletin boards display items of organizational interest much like the traditional form of office announcements.



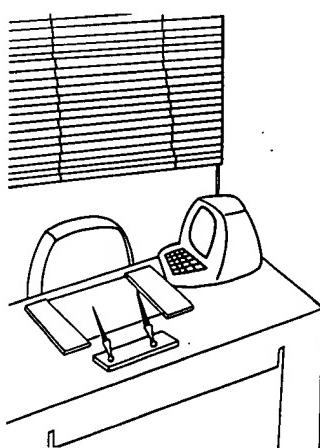
### Communicate anywhere, anytime

Special delivery options allow information to be accessed through a terminal, word processor, or delivered to an unattended device such as a TWX or Telex terminal.



### Cut communication costs

Direct dollar savings accrue from reduced telephone, Telex and TWX charges. You'll also realize the indirect benefits associated with increased productivity.



### Reduce clutter and office space with paperless files

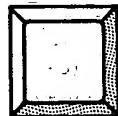
The Telemail service provides unlimited information storage and easy information retrieval. You can set up your own files or use a common electronic filing system.

# LEARNING THE BASICS

Telemail is designed to be used by anyone within your organization with ease. Users "talk" to Telemail with everyday office terminology. A first-time user can learn the Telemail basics in less than 30 minutes using these commands:

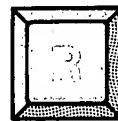
## SCAN

Displays a table of information about new mail residing in your mailbox, information that has not yet been read.



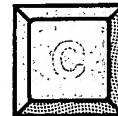
## READ

Displays the contents of mail within your mailbox and catalog, pausing after each one to allow you to take action upon that particular message.



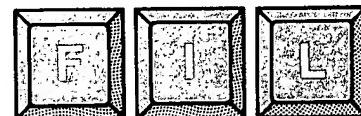
## COMPOSE

Enables you to create a message to be sent or stored in your own catalog.



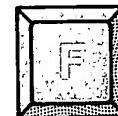
## FILE

Allows you to organize information within your catalog under filenames for subsequent retrieval.



## FORWARD

Enables you to forward a copy of information exactly as it was received, or you can add comments of your own.



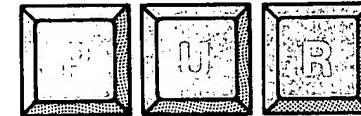
## ANSWER

Lets you reply immediately to the sender of a message with a minimum of text entry.



## PURGE

Lets you erase a message from your catalog if you have no further use for it.





## BACKED BY A LEADER

GTE Telenet's business is providing communications services. And an important part of that service is the support you receive when using Telemail. Quality and reliability cost no more with Telemail.

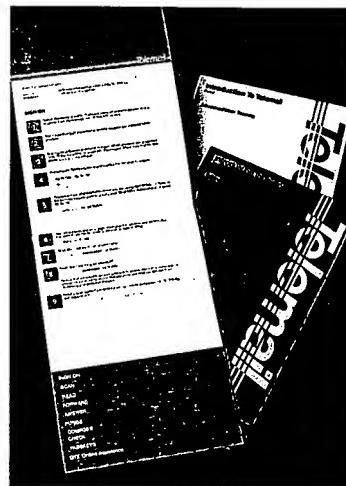
### TECHNICAL SUPPORT

Telemail representatives help you analyze your company's communications requirements, recommend ways in which the Telemail service can improve information flow and productivity, and assist you in preparing a cost/benefit analysis, if necessary. As a Telemail customer, you receive support in developing specialized forms and reports to fit your particular business needs.



### TRAINING

As a leader in sales of electronic information systems, GTE Telenet has developed an extensive documentation and training program for Telemail. Easy-to-use instruction guides, online training, reference manuals, and system administrator's guides are an integral part of the Telemail service.



### CUSTOMER SERVICE

A toll-free number or a Telemail message puts you in touch with GTE Telenet's Customer Service department when questions arise. This support is especially important during peak usage outside normal business hours and in different time zones.

### FAILSAFE PROCESSING SYSTEM

Data integrity and system availability are essential to moving time-critical information. Telemail information processors continue to operate even if a component fails. Repairs can take place while the system continues to operate on a 24-hour basis.

### TERMINAL SELECTION

Your company may already have data terminals, personal computers, or communicating word processors that can do double duty for Telemail use. If not, GTE Telenet offers a selection of desktop video display terminals, hardcopy printers, and keyboard portables at attractive rates.



## YOUR LINK TO THE OFFICE OF THE FUTURE

An investment in the Telemail service assures continuing product support and future enhancements. GTE Telenet is committed to its leadership role in the business communication marketplace, assuring you of continuing technological innovation.

Enhancements to the Telemail service are an ongoing activity. In the future Telemail will evolve into a high-speed multimedia distribution system. Network interfaces will be developed for new types of equipment and technologies. Telemail will provide global communications through interconnection with other similar services domestically and internationally.

A commitment to Telemail today will result in a significant payoff to your company for the long term—a payoff in reduced communications costs and increased productivity.

Let Telenet show you how the Telemail service can help your business communicate more effectively.

For further information, contact:

**GTE Telenet Communications Corporation**  
8229 Boone Boulevard  
Vienna, Virginia 22180  
800-TELENET  
800-835-3638

Or any GTE Telenet sales office nationwide.

**GTE Telenet Regional Telemail Sales Offices**

**1700 N. Moore Street  
Suite 1710  
Arlington, VA 22209  
(703) 243-7510**

**One Penn Plaza  
Suite 4826  
New York, NY 10119  
(212) 868-2230**

**2 North La Salle Street  
Suite 2107  
Chicago, IL 60602  
(312) 782-6119**

**12832 Valley View  
Suite 105  
Garden Grove, CA 92645  
(714) 891-4481**

**GTE Telenet Communications Corporation  
8229 Boone Boulevard, Vienna, VA 22180  
(800) 835-3638 or (800) T-E-L-E-N-E-T**

© 1983 GTE Telenet Communications Corporation



## PROPERTY & CASUALTY INSURANCE

*You've just revised a key property insurance policy and need to get the word to your agents and brokers fast. Business is booming, but you now must hire more clerks to process the additional paperwork. Your telephone rates are going up—and that means your profits could go down.*

The insurance business runs on paper and on constant communication between the home office and agents and brokers in the field. Mail can be slow, however, and handwritten documents can contain errors due to illegible handwriting. Mailgram, telephone, TWX and Telex communications can be expensive; especially if many, geographically dispersed offices must be reached.

You need Telemail<sup>SM</sup>, the electronic messaging and information distribution service from GTE Telenet. Telemail service can deliver information such as policy changes, rate and premium listings, and new services faster than the mail and at a lower cost than long distance telephone.

**Telemail**  
*The Instant Electronic Link*

**GTE** Telenet

### Applications

The Telemail service ties together your headquarters and your field offices, whether agents or independent brokers. Policies can be more efficiently processed in the field and broadcast to insurance companies simultaneously for acceptance or rejection. Insurance companies can respond to individual agents and brokers in a similar manner. Telemail allows the information to be sent either as general messages or customized with electronic forms.

The Telemail service is also ideal for transmitting significant regulatory news, information on specific risks and underwriting problems, and requests for documents and special forms. Telemail can broadcast such information to all brokers and agents quickly and cost-effectively.

Information can be sent to specific individuals, to distribution lists, or to electronic bulletin boards which are available to a large group with a common interest. Bulletin boards can be used to alert all members that new information is available on policies, risks, or regulatory matters.

Telemail is also useful for insurance trade associations that need to communicate rapidly and efficiently with their many members.

## **Features & Benefits**

Telemail can be used with a wide variety of CRTs, hardcopy printers, personal computers, communicating word processors, and portable terminals. The terminal that best suits your in-house information processing needs can also be used for Telemail service.

Errors and incorrect information due to messy handwriting or mispronunciation over the telephone can be eliminated, thus preventing costly mistakes. Telemail eliminates "telephone tag" and the problem of conducting business across different time zones. Your message reaches the recipient's mailbox almost instantaneously and can be picked up at his convenience.

Telemail's Inform Script lets you create your own standardized electronic message forms, making consolidation of information a snap. Automatic validation helps ensure that data is correct.

Telemail service is easy to use. Within minutes anyone can master the system. Once on the system, the user is prompted to take the next step in sending or picking up a message. Plain language user guides will help you get the most out of your Telemail system.

Telemail is available from almost any location. And, the system can be expanded as new users are added.

Messages can be composed off-line and transmitted at night when rates are lower. Priority messages can be sent at any time. Near instantaneous delivery means you can get the information to your agents, brokers, or members as soon as they need it.

You can also use Telemail to communicate with non-Telemail subscribers through links with Telex, TWX, and DDD dial-out delivery. With Telemail, you are never out of touch.

## **GTE Telenet**

Telemail is a service available over the GTE Telenet public data network. GTE Telenet developed the first public access packet switched network in 1975. Packet switching is the fastest, most efficient way to move information electronically over distances.

GTE Telenet was also the first to develop a hybrid network, combining the management control of a dedicated network with the flexibility of access to the public network. Today, the Telenet public data network and Telemail service can be accessed in 350 U.S. cities with a local telephone call, and in more than 50 overseas locations. Telemail is available 24 hours a day, 365 days a year, and is backed by trained customer service technicians available on-line and on site.

*Let us show you how to put Telemail to work for you. Call 800-835-3638 (800-T-E-L-E-N-E-T) or write to us at:*

**GTE Telenet  
Communications Corporation**  
Network Applications and Terminals  
8229 Boone Boulevard  
Vienna, Virginia 22180

Subscriptions, invoicing and other customer-related business are generally handled by the communications administration in each country. The local communications administration provides each subscriber with instructions for accessing the local network and handles any local service-related problems.

For further information, or to order service, users should contact the administration in each country where service is required.

Further details concerning tariffs, access to the Telenet Network and national sales offices are provided in GTE Telenet's on-line data base. You need not be a subscriber to use this service. Simply follow local access procedures established by your PTT to connect to 311021200141[CR]. The Telenet Network will respond with system prompt; then enter:

User Name? INTL/Associates [CR]  
Password? INTL [CR]

## **GTE Telenet International Office**

GTE Telenet Communications Corporation  
Network Systems and International Services

8229 Boone Blvd.  
Vienna, Virginia 22180  
U.S.A.

Telephone: (703) 442-1000  
Telex: 248419 GTE TCC

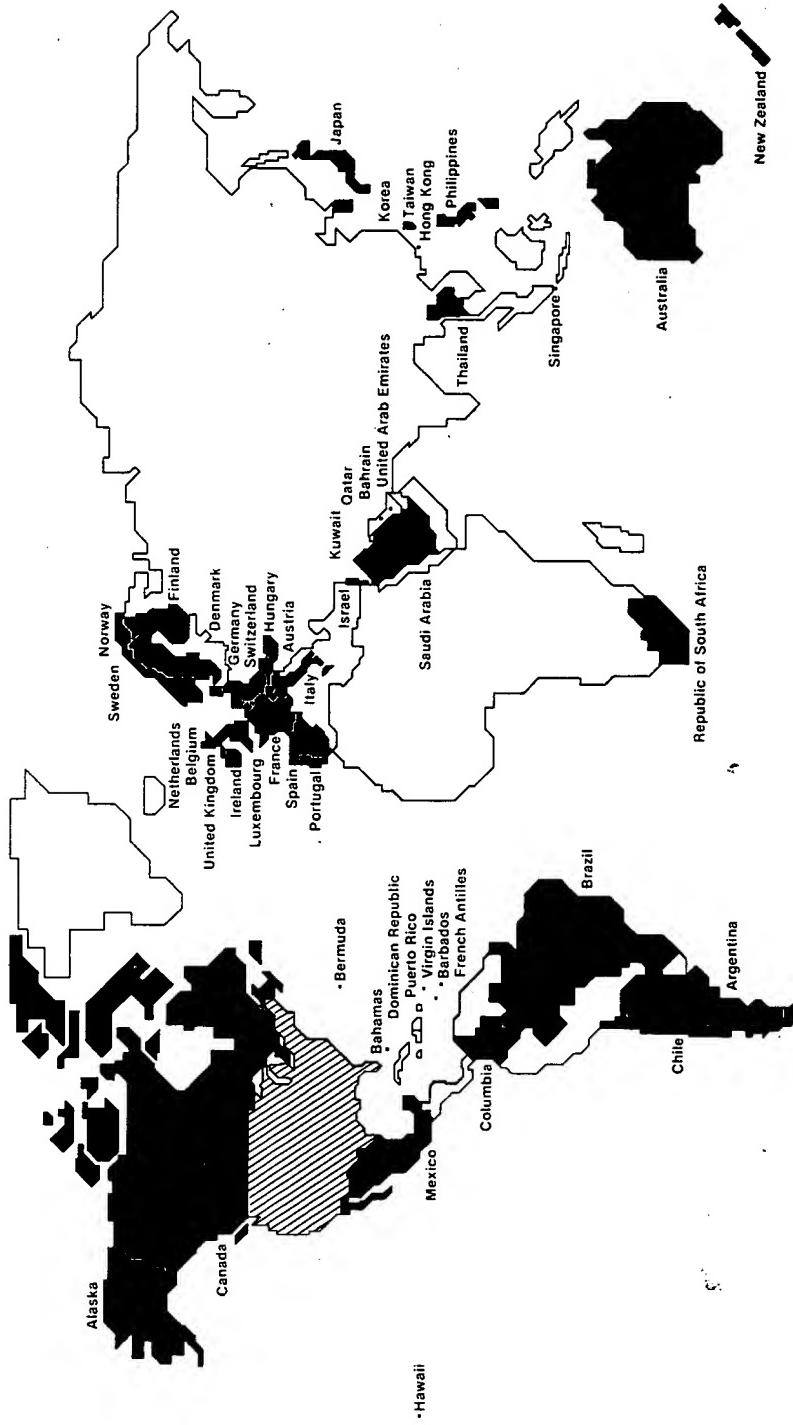
**GTE Telenet**



© 1983 GTE Telenet Communications Corporation  
2920M0983

**International Access  
To the  
GTE Telenet Public Data Network**

**September 1983**



**International Access  
To the  
Telenet Network**

**Best Available Copy**

**Alaska (Δ O)**  
Mike Nichols  
AlaskaNet, Inc.  
949 East 36th Avenue  
Anchorage Alaska 99504  
Telephone: (907) 264-7396

**Argentina (Δ O)**  
Mr. Maximo Garfinkel  
Manager of International Services  
ENTEL  
Rivadavia 622-2 Piso  
(1002) Buenos Aires Argentina  
Telephone: (541)-336-565  
Telex: 18511

**Australia (Δ O)**  
Mr. Brian Cathigan  
Overseas Telecommunications Commission  
Marketing Branch  
Box 7000 GPO  
Sydney 2001 Australia  
Telephone: (612) 230-5000  
Telex: 20591 AA

**Austria (Δ O)**  
Mr. H. Kuebler  
Radio Austria A.G.  
Rennweg 14  
A-1010 Wien Austria  
Telephone: (43-222) 636-651  
Telex: 114731 RA A

**Bahamas (Δ O)**  
Mr. Anthony Wheetch  
Sales/Marketing Manager  
BATELCO  
Box N-3048  
Nassau Bahamas  
Telephone: (809)-323-4911  
Telex: 20135

**Bahrain (Δ)**  
Mr. Ebrahim Raees  
Bahrain International Communications  
P.O. Box 14  
Manama Bahrain  
Telephone: (973)-248-213  
Telex: 8790 BTCCOM BN

**Barbados (Δ)**  
Mr. Keith B. Lewis  
Cable and Wireless Limited  
Bridgeport Barbados  
West Indies  
Telephone: (809)-427-5000, ext. 211  
Telex: (302) 2262

**Belgium (Δ O)**  
Mr. Hendriechs  
Regis des T.T.  
Departement Transmissions de Donnees  
Tour Roi Baudouin, 3eme Etage  
Boulevard Emile Jacquier, 164  
B 1000 Brussels Belgium  
Telephone: (322) 213-3553  
Telex: 29257 DATA B

**Bermuda (Δ)**  
Mr. Churchill L. Jr.  
Commercial Manager  
Cable and Wireless, Ltd.  
Church Street  
Hamilton H-31 Bermuda  
Telephone: 809/295-4777, ext. 247  
Telex: 3222

**Brazil (Δ O)**  
Mr. Rolf Hanel  
Marketing of Services Section  
International Division  
Embratel  
Av. Presidente Vargas, 1012  
Sala 637  
Rio de Janeiro Brazil  
Telephone: (5521)-216-8328  
Telex: 212185

**Canada (Δ O)**  
Sales Support  
The Computer Communications Group  
Transcanada Telephone System  
Floor 8  
220 Laurier Avenue  
Ottawa Ontario K1P 5Z9 Canada  
Telephone: 613/237-6540

**Chile (Δ O)**  
Mr. Eugenio Bonnefond  
ECOM  
Casilla 14796-Correo 21  
Santiago Chile  
Telephone: (562) 68-655  
62-606  
67-027  
Telex: 0381 ECOM C2

**Colombia (Δ)**  
Mr. Hernan Castilla  
Oficina De Difusion y Asimision  
Empresa Nacional de Telecomunicaciones  
Calle 23 No. 13-49, Piso 8  
Bogota Colombia  
Telephone: (572) 41-2187  
Telex: (396)-44288

**Denmark (Δ)**  
Mr. Jorn Ornsaes  
General Directorate of Posts and Telegraph  
Farvergade 17  
DK-1007 Copenhagen Denmark  
Telephone: (401) 116-605, ext. 265  
Telex: 22999

**Dominican Republic (Δ)**  
Mr. Mario del Pozo  
Puerto Rico Telephone Company  
GPO Box 998  
San Juan Puerto Rico 00936  
Telephone: (809)-702-6262

**Dominican Republic (Δ)**  
John M. Acosta Seda  
ITT World Communications  
P.O. Box 4472  
San Juan Puerto Rico 00905  
Telephone: (809)-721-2520,  
721-1222,  
721-2144

**Finland (Δ)**  
Mr. Erkki Sorha  
General Directorate of Posts and Telegraphs  
Foreign Division  
P.O. Box 528  
00100 Helsinki Finland  
Telephone: (358)-105-4838  
Telex: 124557 GENIT SF

**France (Δ O)**  
Mr. C. Gobert  
Direction des Telecommunications des ReSEAUX Exterieurs  
Service Comercial/N.T.I.  
21, rue de la Banque  
75084 Paris Cedex 02 France  
Telephone: 233-2616 (national)  
(331)-233-5122, ext. 4323 (international)  
Telex: 210775 CIALNTI

**French Antilles (Δ O)**  
Service Comercial/N.T.I.  
21, rue de la Banque  
75084 Paris Cedex 02 France  
Telephone: 233-2616 (national)  
(331)-233-5122, ext. 4323 (international)  
Telex: 210775 CIALNTI

**Germany (Δ O)**  
Deutsche Bundespost Fiz T21  
Fernmeldelechnische Zentralamt  
Beratungsstelle Datendienste  
Post Box 5000  
6100 Darmstadt Germany  
Telephone: (49) 6151-83-4641  
Telex: 419511

**Hawaii (Δ O)**  
Mr. Ian MacLaren  
Hawaiian Telephone Company  
P.O. Box 2200  
Honolulu Hawaii 96841  
Telephone: (808) 546-2054

**Hong Kong (Δ)**  
Mr. Albert W.Y. Yung  
Public Services Account Manager  
Cable and Wireless (HK) Ltd.  
North Morocco House  
22 Fenwick Street  
Wanchai Hong Kong  
Telephone: (852) 5-283-1628  
Telex: 83000 CWCWOMHX

**Hungary (via Austria)**

**Ireland (Δ O)**  
Mr. Dermot Crawford  
Telecom Services  
Telecommunications Branch  
Department of Posts and Telegraphs  
Marlborough Street  
Dublin 1 Ireland  
Telephone: (353)-1-748-888  
Telex: 25116

**Israel (Δ O)**  
Mr. David Hyman  
Ministry of Communications  
Telephone Service  
12 Korash Street  
91999 Jerusalem Israel  
Telephone: (972)-230-334  
Telex: 25269

**Italy (Δ O)**  
Mr. Lorenzo Rossi  
Italcable  
Via Calabria, 46-48  
00187 Rome Italy

Telephone: (396)-477-0366  
Telex: 611146

**Japan (Δ O)**  
Dr. Hideki Kuroda  
KDD Commercial Department, Tokyo  
Marunouchi Mitsui Building, 1F  
2-2, Marunouchi, Chiyoda-Ku  
Tokyo, 100 Japan  
Telephone: (813)-240-8447  
Telex: 24700 KDDSALES

**Korea (Δ)**  
The Business Office  
12th Floor, The Korea Stock Exchange Building  
1-16 Yeoeido-Dong, Yeongdungpo-Ku  
Seoul Korea  
Telephone: (352)-26002 or  
(352)-476-5218  
Telex: (787) 28311

**Kuwait (via Bahrain)**

**Luxembourg (Δ O)**  
Mr. Nicolai  
Centre des Telecommunications  
Postbox 999  
2019 Luxembourg  
Telephone: (352)-26002 or  
(352)-476-5218  
Telex: 3450

**Mexico (Δ O)**  
Mr. Jose T. Lopez Segura  
Secretaria de Comunicaciones y Transportes  
Torre Central de Telecomunicaciones  
Eje Lázaro Cárdenas, #567  
03020 Mexico, D.F., Mexico  
Telephone: (905)-530-3982  
(905)-530-3060, ext. 368

**The Netherlands (Δ O)**  
Telecommunications Commercial Affairs  
DCT-DATA  
P.O. Box 30000  
2500 GA The Hague The Netherlands  
Telephone: (3170)-758-611  
Telex: 31111 DCTDATA

**New Zealand (Δ)**  
Mr. Wayne Williams  
Telecommunications Division  
Post Office Headquarters  
Wellington New Zealand  
Telephone: (644)-738-444  
Telex: 3381

**Norway (Δ)**  
Teleldirektoratet, Datelkontoret  
Postboks 6701  
St. Olavs Pl  
Oslo 1 Norway  
Telephone: (472)-488-724  
Telex: 11203

**The Philippines (Δ)**  
Mr. Roger M. Pura  
ETPI  
115-117 Esteban House  
Legaspi Village, Makati  
Metro, Manila The Philippines  
Telephone: (632)-856-011  
Telex: 63305 PTNET PN

△ Leased Lines

□ Public Dial

○ Bidirectional

**The Philippines (Δ)**  
Mr. George E. Tan  
Director, Marketing  
Philippine Global Communications, Inc.  
8750 Paseo de Roxas  
Makati 3117  
Metro, Manila The Philippines  
Telephone: (632)-818-0881  
Telex: 22388 GMPH

**The Philippines (Δ)**  
Mr. Antonio M. Urrera, Marketing Director  
Global-Macmillan Cable and Radio Corporation  
1119 Lisboa Codex Portugal  
Manila RP 2801 The Philippines  
Telephone: (632)-50-60-81  
Telex: 742-0005

**Portugal (Δ)**  
Mr. Carlos Cardiga, Marketing Department  
P.O. Marques de Pombal 15-4  
Aparlado 2778  
1119 Lisboa Codex Portugal  
Telephone: (351)-19-534-191  
Telex: 14006 CPRM P

**Puerto Rico (Δ O)**  
Mr. Mario del Pozo  
Puerto Rico Telephone Company  
G.P.O. Box 998  
San Juan Puerto Rico 00936  
Telephone: (809)-792-6262

**Puerto Rico (Δ O)**  
Mr. John Acosta/Olga Seda  
ITT World Communications  
P.O. Box 4472  
San Juan Puerto Rico 00905  
Telephone: (809)-721-2520  
721-1322  
721-2144

**Puerto Rico (Δ O)**  
Mr. Angel Feliciano  
RCA Global Communications Inc.  
701 Ponce De Leon Ave.  
San Juan Puerto Rico 00904  
Telephone: (809)-723-4800

**Qatar (via Bahrain)**

**Saudi Arabia (via Bahrain)**

**Singapore (Δ O)**  
Mr. Siew Chee Kheng  
Business Telecommunications Sales Dept.  
Telecommunication Authority of Singapore  
Concentric 31 Exeter Road  
Singapore 0923  
Telephone: (65) 734 3344  
Telex: RS 33311

**Republic of South Africa (Δ O)**

Mr. G. van Niekerk  
The Posimaster General  
Telecommunications (3K65)  
Private Bag X74  
0001 Pretoria  
Republic of South Africa

Telephone: (214) 299-1452  
Telex: (960)-30229

**Spain (Δ O)**  
Sr. Victor Sanz  
Compania Telefonica Nacional de Espana  
Plaza de Espana 4  
Madrid Spain  
Telephone: (34)-248-8531  
Telex: 831 2774

**Sweden (Δ O)**  
Stockholm Telecommunications Administration  
Data Sales Division  
Box 7294  
S-103 90 Stockholm Sweden  
Telephone: (468)-780-8750  
Telex: 12020 DATASTH S

**Switzerland (Δ O)**  
Ms. Monique Moser  
Commercial Division  
Radio - Suisse  
Schwarztorstr. 61  
CH-3000, Berne 14 Switzerland  
Telephone: (4131)-659-215  
Telex: 4532192

**Taiwan (Δ)**  
Mr. C.Y. Chow  
Chief of Business Center  
International Telecommunications Administration  
Taipei Taiwan  
Telephone: (8862)-344-3771  
Telex: 11127 8 TD ITA

**Thailand (Δ)**  
Dr. Kittiporn Udomklai  
Director, Telecommunications Division  
Consortium of Telecommunications Authority of Thailand  
Bangkok 10501 Thailand  
Telephone: (662)-233-3724 or  
(555)-233-1050 ext. 2530  
Telex: 70003 SD028

**United Arab Emirates (Δ O)**  
Mr. Rex Coffin  
Emirates Telecommunications Corporation (EMIRTEL)  
Post Office Box 980  
Sharjah United Arab Emirates  
Telephone: (971)-373-473  
Telex: 68377

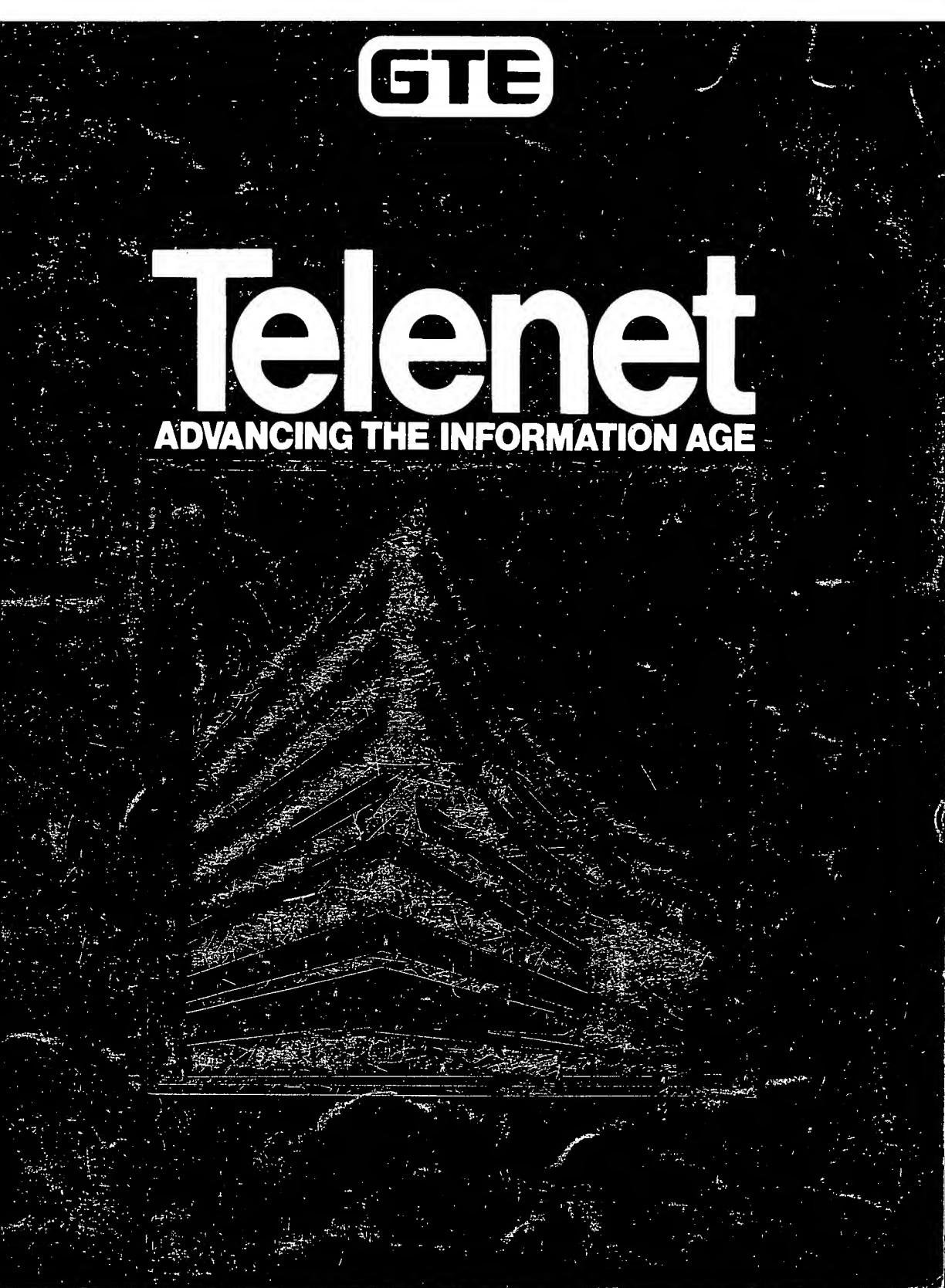
**United Kingdom (England) (Δ O)**  
British Telecommunications  
PSS National Sale Office, 4th Floor  
Seal House  
1 Swan Lane  
Upper Thames Street  
London England EC4R 3TH  
Telephone: (441)-357-4061  
Telex: 88305

**Virgin Islands (Δ O)**  
Mr. John Acosta/Olga Seda  
ITT World Communications  
P.O. Box 4472  
San Juan Puerto Rico 00905  
Telephone: (809)-721-2520,  
721-1322,  
721-2144

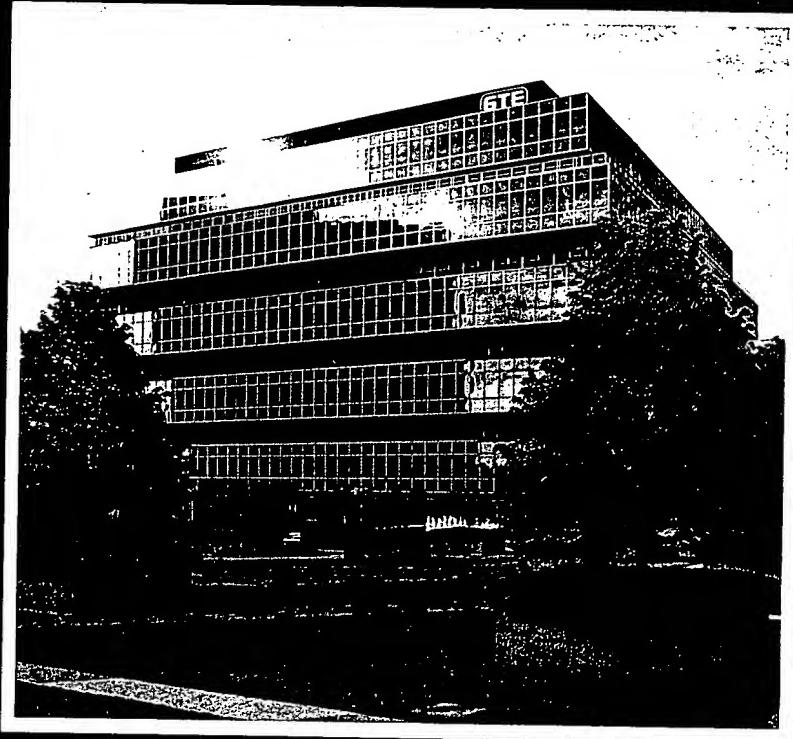


# Telenet

ADVANCING THE INFORMATION AGE







## GTE Telenet: Part of the GTE Communications Family

Telenet became part of the GTE family in 1979. The acquisition furthered a commitment by GTE to retain leadership in the communications field.

GTE has over 60 communications products, research, and service subsidiaries in the 40 states and 19 countries abroad. The company has been in the communications business for over 90 years and has had extensive experience in virtually every area of the industry, including satellite, fiber optics transmission, microwave, voice, and voice/data.

GTE recently was asked by the Westinghouse Corporation to design and install an integrated voice/data facility in the Pittsburgh area, covering some 60,000 lines. This system will require the applications of a broad spectrum of the capabilities inherent to the GTE family of communications companies, and it illus-

trates the migration to integrated voice/data facilities required by large organizations geographically dispersed with many separate locations.

The ability to provide this type of integrated system will become increasingly important as we advance further into the Information Age. GTE's Satellite Corporation (GSAT) will start operations in late 1982, providing high speed communication levels via satellite in a number of U.S. cities. In 1984 they will launch their own satellite, specifically designed for voice/data transmission. Local distribution at high speeds will be handled by digital transmission systems using low-power microwave channels or fiber optic cables.

GTE Telenet. GTE. Qualified experts in telecommunications helping companies and organizations advance into the Information Age.



**T**he Information Age is here. It's the concept of having important data stored, classified and readily available. And it's the concept that business organizations have means to access that data and fast, reliable ways of moving it where it's needed.

GTE Telenet was an early pioneer in the Information Age. We initiated the first public access packet switched data network in 1975, long before others saw the need. Our network has grown from an initial seven city system to one offering service in over 250 cities and more than 40 countries. And our network offers the means to access data and move it about economically.

Our expertise in network design and the superior performance of our hardware have also helped users implement their own dedicated networks. Our reputation prompted such countries as the United Kingdom and Mexico to ask us to design and install their nationwide packet switched data networks.

We were also the first to conceive the idea of the hybrid data network—a way of having the best features of both dedicated and public network service at the same time. A hybrid network is less expensive over a period of time and offers better management control while retaining the flexibility of the GTE Telenet public network.

Another innovative idea was Telemail<sup>SM</sup> an electronic mail system introduced in 1980. Telemail allows managerial personnel to send and receive messages regardless of time zone or personnel availability considerations. As a result it's a service that's revolutionizing the way business is conducted.

GTE Telenet is solving the information needs of the medical community as well. In a joint venture with the American Medical Association, we are introducing an electronic medical information system, called Minet<sup>SM</sup> providing up-to-date information for physicians and other allied health care professionals in hospitals, clinics and medical centers.

Lastly, our Micro-Fone<sup>®</sup> data terminal is an important breakthrough for retail businesses. It allows merchants to verify credit or check validity in just 20 seconds.

With these innovative products and services, GTE Telenet stands ready to help companies and organizations move into the Information Age. In addition to technical and managerial expertise, GTE Telenet has the resources of GTE, an 11 billion dollar high technology company firmly committed to filling present and future communications needs.

GTE Telenet. Pioneer. Innovator. Universal. Essential to advance the Information Age.



# The Public Data Network

The GTE Public Network was the first data network to offer the packet switched technique. An innovative technology, packet switching is the fastest and most efficient way to move information over distances electronically. The Public Network functions in the data mode much the way the Public Telephone Network functions in the voice mode. As an adaptive, flexible data network Telenet can accommodate a wide variety of interactive and transaction-oriented computer applications; including 3270 terminal access.

Telenet's primary use is by businesses who need vital data/information available where needed, as needed at a low cost.

Many subscribers use the network to provide economical remote access to in-house time sharing, text editing, management information,

and message processing. Commercial service bureaus and colleges and universities use the network for special applications programs as well as general time sharing. Public and private organizations retrieve information from statistical and bibliographic data bases. And banks and financial institutions take advantage of the speed and availability of the network in cash management and credit transactions.

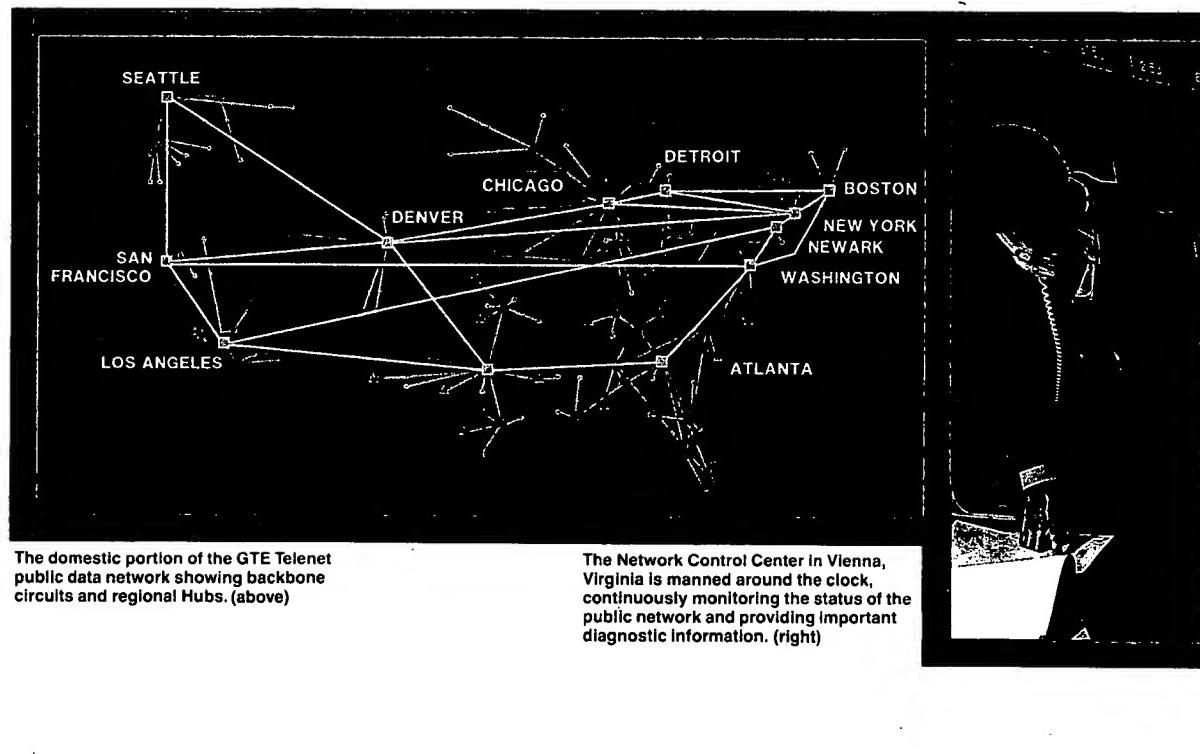
The network itself is made up of a group of high speed circuits collectively known as a backbone. These circuits are capable of handling data at speeds up to 56 kilobits per second. They are interconnected by a series of switching nodes, which effectively interpret and direct the flow of data between themselves and other nodes. They also operate independently of each other, assuring the highest possible

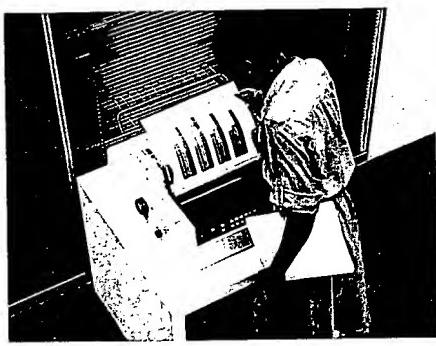
reliability to the user.

Each switching node forms the hub of an efficient regional distribution network, linking access points and switching centers in outlying cities via one or more access circuits at speeds up to 9.6 kilobits per second.

The entire network is monitored by the Telenet Network Control Center (NCC) located in Vienna, Virginia. The NCC function is to identify, isolate and correct any network malfunction, frequently before users are even aware of it happening. Supporting this group is our customer service center, available for troubleshooting 24 hours a day, 365 days a year.

Availability. Adaptability. Flexibility. Reliability. All attributes of the GTE Telenet public network. A prime data communications service for entry into the Information Age.

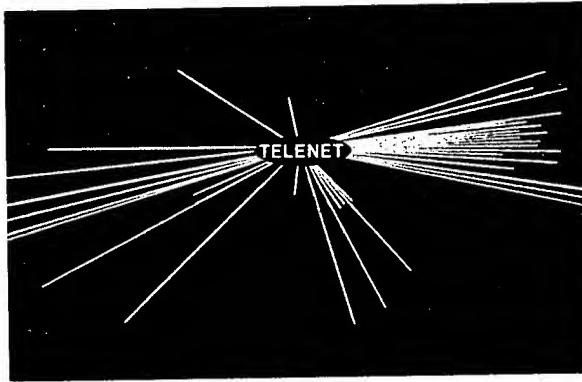




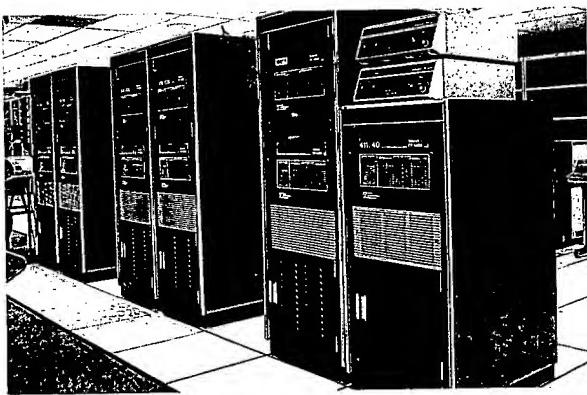
GTE Telenet's 3270 multiple host access capability enables 3270 terminal users to access several different computer systems without costly and disruptive system conversion. (below)



Because of the GTE Telenet network ability to match virtually any host/terminal speed, protocol or code conversion, users with dissimilar hosts/terminals, geographically dispersed can now communicate with each other. (above)



GTE Telenet's International Services permit public data network users to integrate network applications offering worldwide coverage. (right)



A key component in the GTE Telenet public data network is the TP4000 host/terminal interface processor and packet switch. Shown here in a GTE Telenet switching center, the TP4000 was specifically designed for use in a packet switching network. (above)

# Dedicated and Hybrid Networks

**A**s the supplier of the largest dedicated packet switched network in the United States, as well as the national data networks for countries such as the United Kingdom and Mexico, GTE Telenet is recognized as the worldwide leader in this area.

For high volume users with concentrated traffic profiles, dedicated or private networks can offer the most cost effective solution for data communications while facilitating direct user management and control. By balancing the three primary functions in a network; access, switching and management; GTE

Telenet's Dedicated Network Systems architecture allows for a high degree of flexibility while integrating standard and unique user requirements. GTE Telenet's expertise can be of great assistance in designing an optimal network.

Once the network design has been finalized, GTE Telenet systems engineers proceed with implementation; ordering the proper equipment, installing it, and training appropriate personnel in the operation and maintenance of it.

GTE Telenet can also provide a Network Control Center geared to the specific needs of individual

users. There are several options available based on network size and complexity.

Some companies find their needs best met by a combination of dedicated facilities complemented by access to the GTE Telenet public network. This concept, also pioneered by GTE Telenet, is called a hybrid network. It features the cost savings and controls inherent in a dedicated network, together with the flexibility and availability of the GTE Telenet public network.

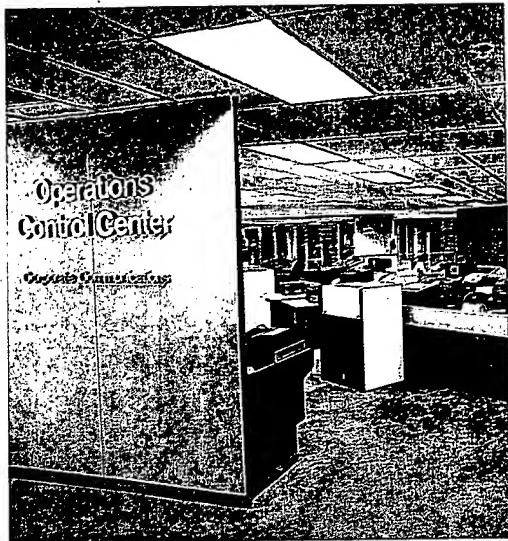
Dedicated network or hybrid network—two more ways to advance into the Information Age.



National public data networks for Mexico and the United Kingdom were furnished by GTE Telenet. (above)

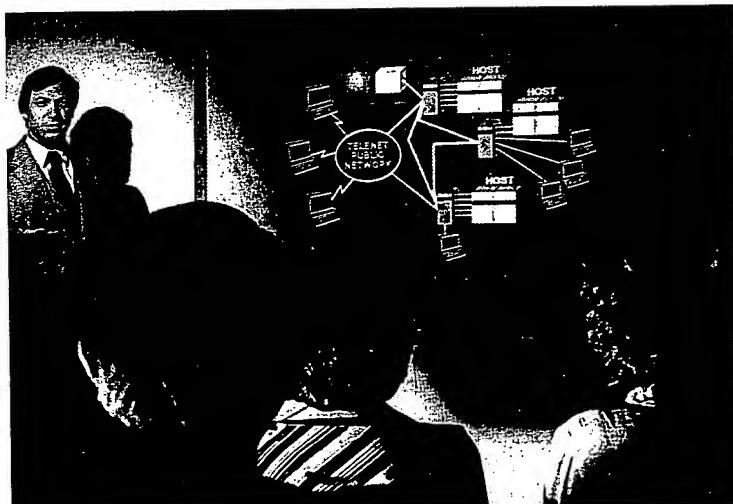
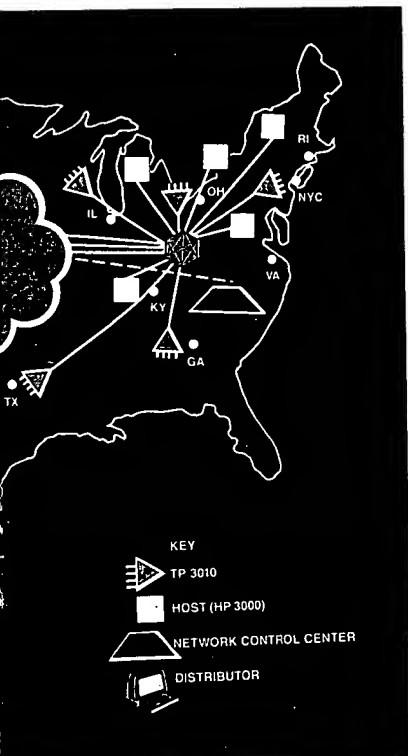
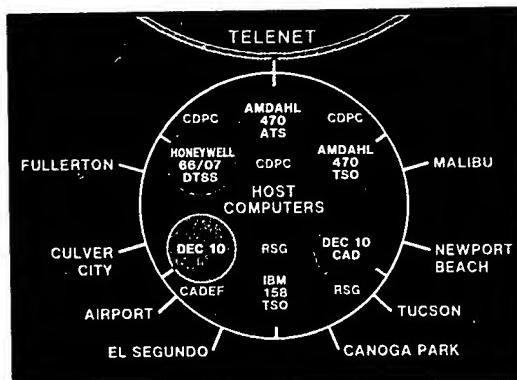


A large midwestern manufacturer of machine tools and parts operates a hybrid network across the entire country. A hybrid network is one in which the customer has all the functions and features of his own dedicated network together with the flexibility, accessibility and availability of the GTE Public Data Network. This customer also utilizes the GTE Telenet Network Control Center to monitor his network. This network basically interconnects the home office with the sales offices and 100 distributors.



A large southeastern corporation has installed a GTE Telenet furnished dedicated network to handle its administrative data requirements. This particular user opted to have his own Network Control Center (NCC) shown here. (left)

This GTE Telenet supplied dedicated network ties several geographically dispersed computer centers together and provides connection to the GTE Telenet public network. (below)



Training seminars are provided to customers to maximize the capabilities of their GTE Telenet dedicated networks.  
(above)

**GTE**

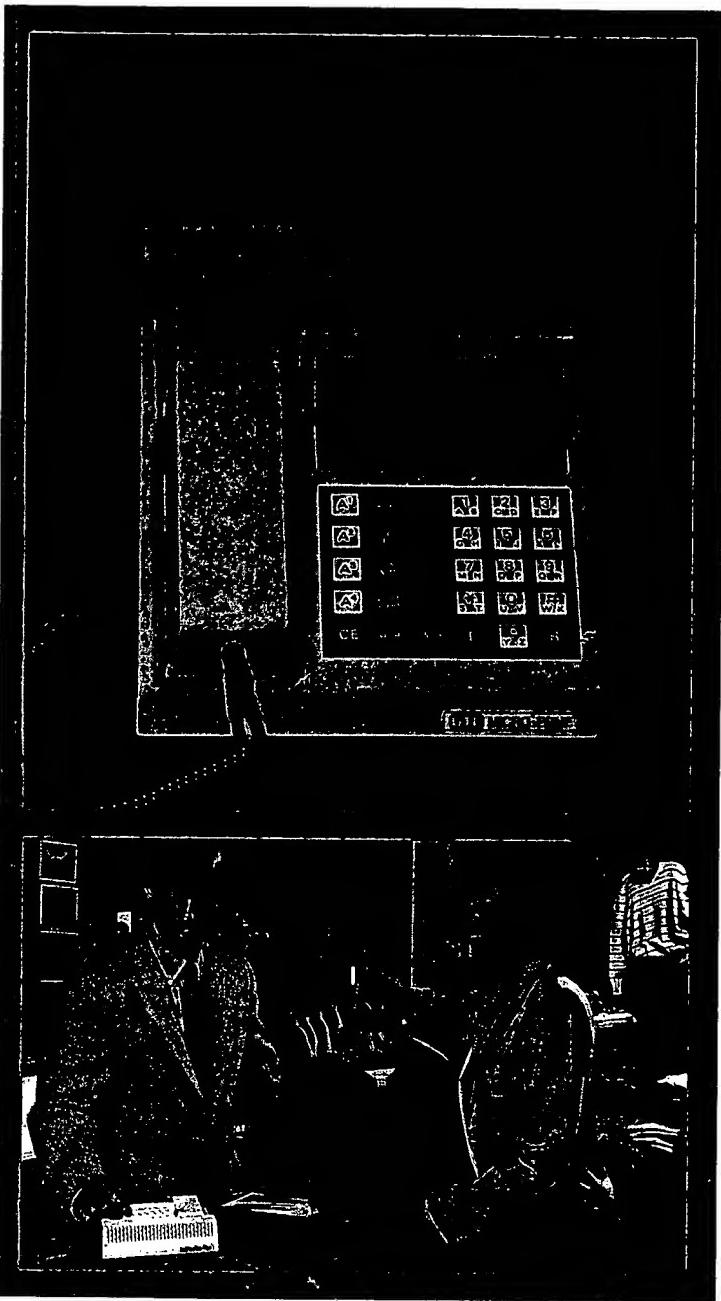
# Micro-Fone®

**M**icro-Fone is a special purpose terminal for handling the process of credit and check verification. Introduced by GTE Telenet in 1980 Micro-Fone has quickly become the overwhelming choice of banks and financial institutions serving large numbers of retailers for their credit verification needs.

Micro-Fone enables a merchant to perform credit and check verification in less than 20 seconds, a significant improvement over present methods. Micro-Fone reads the information on the magnetic strip of the back of the credit card. When the retailer presses a button on the instrument, the information is transmitted and verified at the data center—perhaps hundreds of miles away.

Micro-Fone also functions as a normal telephone, saving more money by replacing an existing unit. With its built-in memory, it can store up to 14 frequently dialed numbers which can be dialed at the touch of a button.

Micro-Fone. Helping bankers, financial institutions and retailers advance into the Information Age.



(top) Micro fone terminals perform credit and check verification fast—typically in less than 20 seconds (LL) Micro fone also functions as a normal telephone and can "remember" 14 frequently dialed telephone numbers (LR). Micro fone is easy to use and easy to learn.

# Telemail<sup>SM</sup>

**T**elemail is GTE Telenet's electronic mail or messaging service. It was introduced in 1980 and was one of the earliest services to offer a powerful, "user friendly" comprehensive messaging capability.

Telemail permits a user to compose and send messages, read messages, even file messages for later recall. Messages can be sent or received from virtually anywhere in the United States, using local dial-in telephone numbers. Telemail is time-insensitive, so a message can be sent from New York at 9 a.m. to the West Coast, even though the time there is only 6 a.m. When the recipient gets to his office, the message will be waiting in his Telemail mailbox, thus providing efficient,

nonsimultaneous communications.

And Telemail is easy to use. It guides the user with "prompts" or instructions. Users "talk" to Telemail utilizing office terminology such as "read", "send" and "scan". Any one can master the basics of Telemail in less than 30 minutes of instruction and practice.

Telemail was conceived as an improved communications vehicle for upper level management. Typical applications include communication between geographically dispersed locations, distribution of time-sensitive information; and distribution of information to several locations from one location.

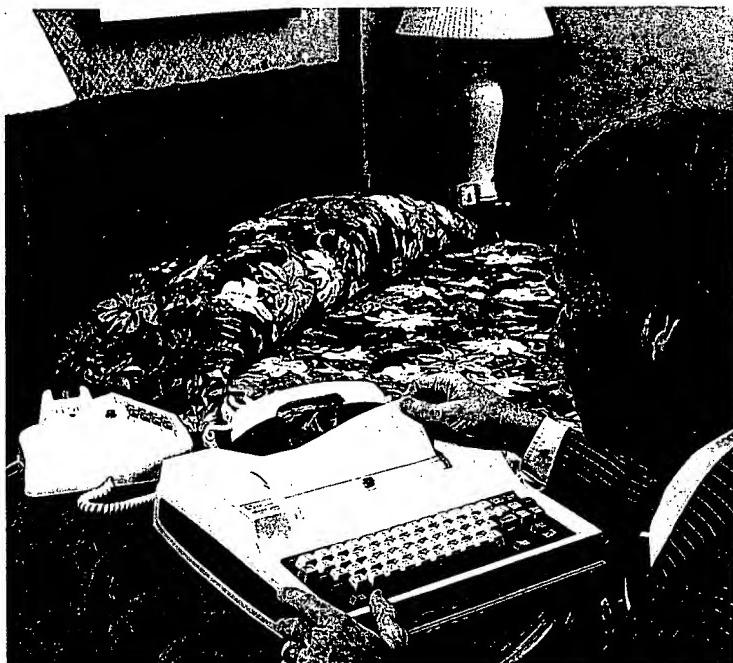
Telemail. Another major management tool to speed advancement into the Information Age.



With portable terminals, users can "keep in touch" wherever they travel.  
(above)

A Telemail user can enter or receive messages anywhere he can have access to a telephone and a terminal. (L.)

Over 75% of Telenet users are at the managerial or executive level. Here a user accesses his "mailbox" using the new GTE XT-300 terminal. (below)



# Medical Information Network

The advent of the Information Age has also impacted the medical field. With the vast amounts of information available to today's physicians and the demands placed on these physicians to access that information, GTE Telenet and the American Medical Association jointly designed a new data base service called MINET<sup>SM</sup>, created to hasten information access conveniently, and at reasonable cost.

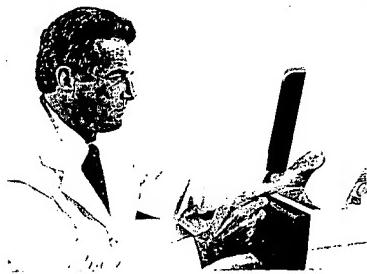
Through the use of a low cost terminal physicians can now have information on a wide variety of medically-related topics in their offices or homes. Information that used to take hours to acquire through traditional channels can now be retrieved in minutes. And because the service is computer based, information is available virtually any time of the day or any day of the week.

The contents of these information bases cover areas including clinical, administrative and medical practice as well as references to current medical information. They have been prepared by respected authorities in their fields, working under the editorial supervision of the AMA. GTE Telenet, for its part, supplies the network which distributes the information to over 250 cities in the United States.

MINET. Helping doctors and the medical community advance into the Information Age.



A physician can have immediate access to the medical network from his office, home or hospital—anywhere a telephone and terminal are available.

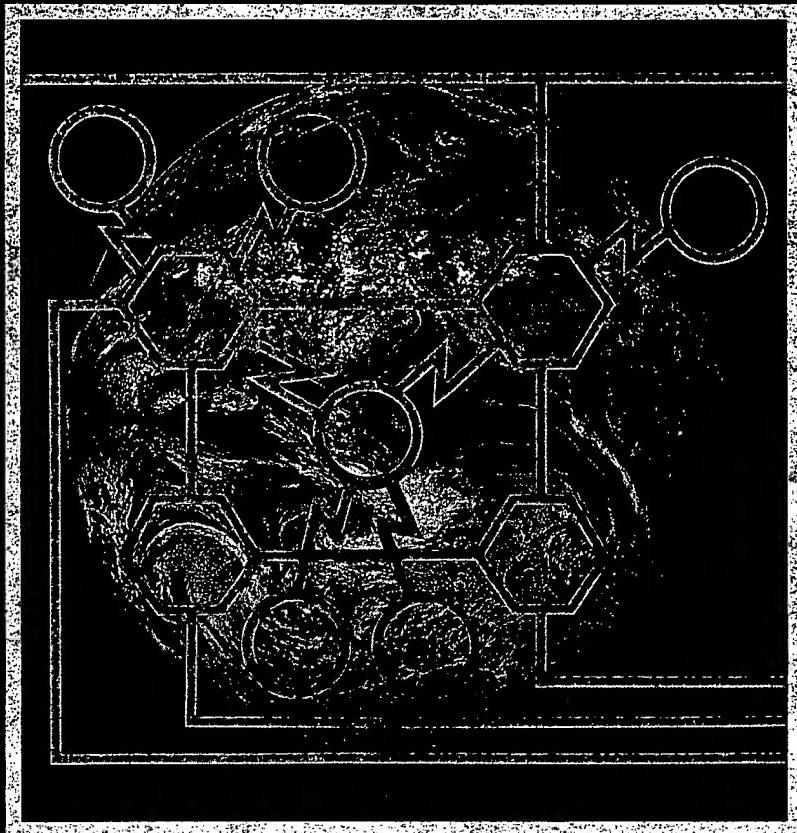


MINET service is expected to replace the library as the preferred source for up-to-date information as physicians move into the electronic information age.

0125M122



# The Public Data Network



**GTE Telenet**  
ADVANCING THE INFORMATION AGE

**T**oday's business organization relies heavily on computer-based resources. And today's communicators rely on GTE Telenet's Public Data Network to meet their data transmission needs.

The GTE Telenet Public Network has gained its reputation as the reliable choice by offering several important user benefits:

- Convenient and low cost network service
- Compatibility with X.25 and related CCITT standards
- No capital investment in costly equipment
- Ease of expansion as service needs grow
- Relief from the problems and responsibilities of network management
- End-to-end customer service and support.

Over 1,000 host computers and several hundred thousand terminals transmit data every day on the Public Network. Usage is as varied as our customer base—from interactive and batch traffic, including 3270 terminal support, to transaction-oriented applications.

Wherever data must be moved efficiently and reliably, the GTE Telenet Public Network is available. Customers can access the network from anywhere in the continental U.S. by simply dialing a local GTE Telenet telephone number or a convenient toll-free WATS number. Internationally, the Public Network interconnects with some 40 overseas points through GTE Telenet's International Gateway Service or through transit carriers.

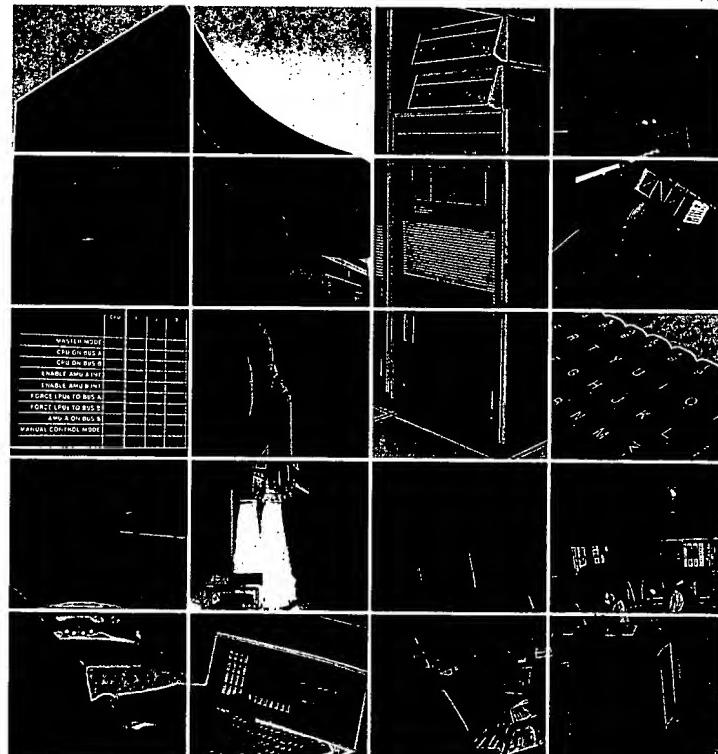
The GTE Telenet Public Network consists of high-speed transmission facilities interconnected by switching centers, located in major U.S. cities. These switching centers, or Telenet Central Offices, form the backbone of the network. They handle terminal and host connections, tie in remote access localities, and route data to its destination.

Overseeing this nationwide system of communication links is the Network Control Center (NCC)—the key to reliable network operation and a unique feature of the Public Network. The NCC continuously monitors network status and assists in diagnosing and correcting malfunctions.

Connecting hosts and terminals to the Public Network requires no basic changes to a user's computer software or hardware. Our network supports many popular synchronous protocols and just about every asynchronous terminal on the market today. The intelligence built into GTE Telenet network concentrators and switches provides the needed interface flexibility.

In addition to providing the economies of packet-switching, GTE Telenet also offers a variety of pricing arrangements based on network usage to maximize savings in monthly communication costs. Our staff of systems engineers and sales representatives works closely with customers to determine the most cost-effective type of access and to tailor network usage.

GTE Telenet's expertise in data communications is further enhanced by our relationship with GTE Corporation, our parent company. GTE has been an innovator in the communications business for over 90 years, with extensive experience in satellite, fiber optic, microwave, and voice/data communications.



# User Benefits

2

GTE Telenet's Public Network combines the benefits of packet-switching and CCITT standard protocols such as X.25 to provide the fastest and most efficient form of electronic data transmission available today. Here are some of the reasons why.

## *Availability*

The Public Network is available 24 hours a day, 7 days a week. It is only a local phone call away in more than 250 cities domestically and in a growing number of overseas points.

## *Ease of Use.*

Users simply dial a local GTE Telenet telephone number or WATS number to connect to a selected host computer on the network.

## *Compatibility*

GTE Telenet's adherence to X.25 and other CCITT standards for network protocols ensures that a user's terminal or host will be supported by any packet network throughout the world. Another important aspect of compatibility is the Public Network's ability to automatically adapt to user equipment in terms of speed, code, and protocol.

## *Reliability*

To ensure that network operations run smoothly, the GTE Telenet Public Network is designed to adaptively route traffic to avoid failure in the network. Telenet Central Offices contain hot standby spares and redundant equipment along with standby power supplies.

## *Flexibility*

The intelligence built into our network concentrators and switches allows individual terminal users to independently access different hosts and applications. This eliminates the need for extra leased lines to support each application.

## *Error Detection*

Powerful error detection and correction techniques on the Public Network assure virtually error-free data transmission—an essential capability for effective computer-to-computer data transfer.

## *Low Cost*

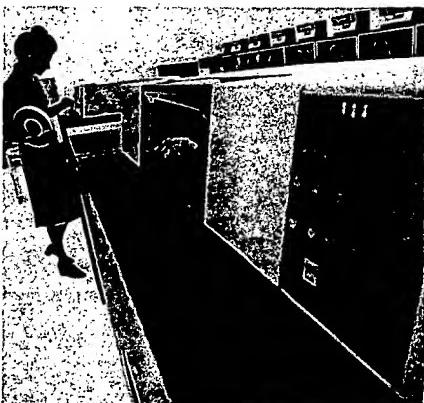
Using GTE Telenet's Public Network means no capital investment in costly equipment. Once connected to the network, subscribers pay only for what they use. In addition, GTE Telenet offers a number of special discounts and extended term arrangements for further savings.

## *Comprehensive Network Management*

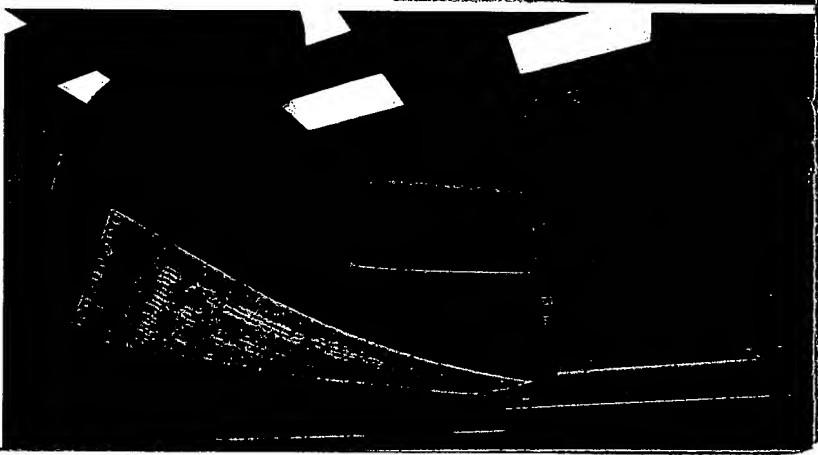
GTE Telenet's Network Control Center (NCC) assumes the responsibilities of network management, leaving customers more valuable time for important administrative functions. The NCC continually monitors network operation, collects network usage statistics, and performs diagnostics to correct malfunctions before they occur. Backing the NCC is the Customer Service group which is available around the clock to assist in troubleshooting and resolving problems.



*The Public Network is within local dialing distance in all 50 states.*



*Computer service bureaus offer a variety of application programs to remote terminal users dialing in through the Telenet network.*



# Some Representative Customers

3

GTE Telenet's Public Network customers represent all facets of the U.S. economy—the small business owner and the large Fortune 500 company. Here is a representative sampling.

## Insurance Agencies

Insurance businesses use GTE Telenet to provide computer cost estimating services. Accurate and up-to-date replacement costs, actual cash values, and depreciation costs are instantly available to brokers, appraisers and claims processors through the Public Network.

## Petroleum Refineries

Petroleum industries use the network to speed distribution of gasoline and fuel oil, provide instant billing information, and update stock records. Using the Public Network also eliminates costly long distance phone calls between distribution centers and the home office.

## Banking Industries

Financial institutions find the speed and availability of the Public Network advantageous for providing brokerage services, funds transfer, and other types of banking transactions.

## Business Services

Computer service bureaus offer a wide variety of interactive timesharing and batch processing computer services to remote terminal users and hosts through the Public Network.

## Health and Educational Services

Colleges and medical institutions use the Public Network to provide highly specialized data bases and analyses to users who need up-to-date information at a reasonable cost.

## Other Users

In addition to these major segments of the economy, the Public Network provides similar services to federal and state agencies, wholesale and retail businesses, hotels, recreational services, and agricultural industries—any organization needing fast, reliable data communications.

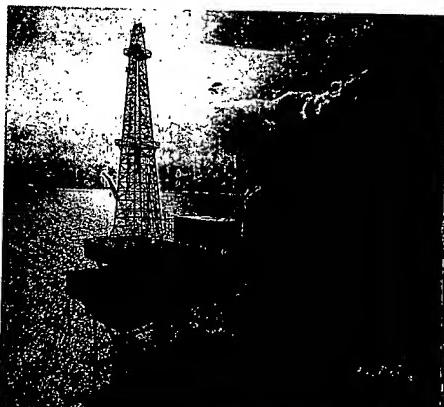
## Network Applications

Network applications are as varied as our subscribers. Typically they might include:

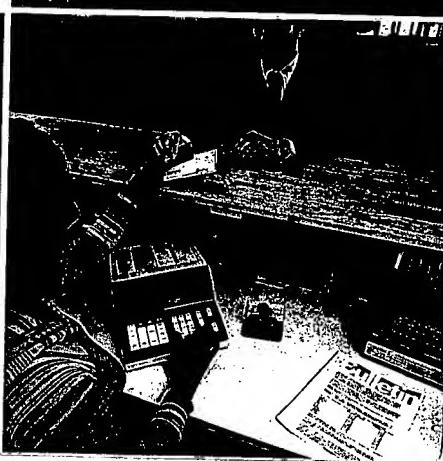
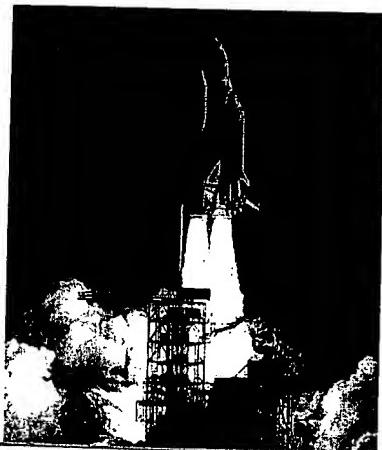
- Interactive data processing
- Data base management
- Transaction processing and credit verification
- Sales forecasting
- Market research
- Medical information services
- Electronic funds transfer
- Inventory control
- Insurance claim processing
- Electronic mail
- Order entry



*Nationwide distribution centers depend on the Public Network to provide shipping information on a daily basis.*



*Aerospace, petroleum, and banking industries use Telenet's services to cut communications costs, boost production and attract new customers.*



# Connecting to Telenet

4

## Terminal Connections

Customers can connect to the Public Network domestically in several ways. Asynchronous terminals at speeds of 300-1200 bps can gain network access through regular telephone lines using *public dial-in* service. This service is ideally suited for organizations with occasional usage in a particular city, since charges are based primarily on call duration.

Another means of access is through *private dial-in* or *dial-out* ports on the network which are dedicated exclusively to a particular customer. Users with a large amount of connect time may find this type of access more economical, since charges are computed on a fixed monthly rate for unlimited use. *Private dial* service also offers the advantages of restricted access and the use of special protocols or control languages.

A third type of access is through a leased channel called a *dedicated access facility* (DAF). A DAF connects synchronous and asynchronous terminals directly to the network.

If multiple terminal support is needed, the user can purchase or lease an on-site GTE Telenet TP3000 or TP4000 series microprocessor to concentrate traffic and allow terminals to share a single access port on the network. The DAF is cost-effective for users who generate large volumes of traffic and need to be online continuously.

## Host Connections

Customer hosts can be connected directly to the Public Network through a DAF in either of two ways:

- Hardware interface—through a GTE Telenet TP3000 or TP4000

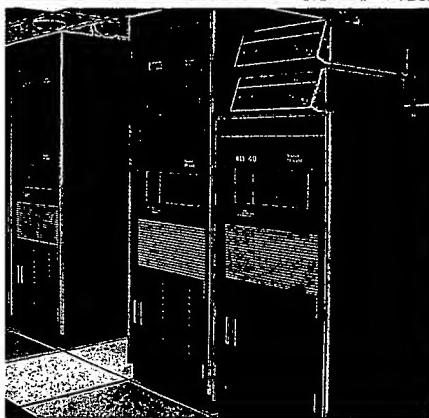
microprocessor specifically designed to handle multiple, simultaneous connections on an X.25 network.

- Software interface—through one of the commercially available X.25 packages for linking subscriber equipment to packet networks.

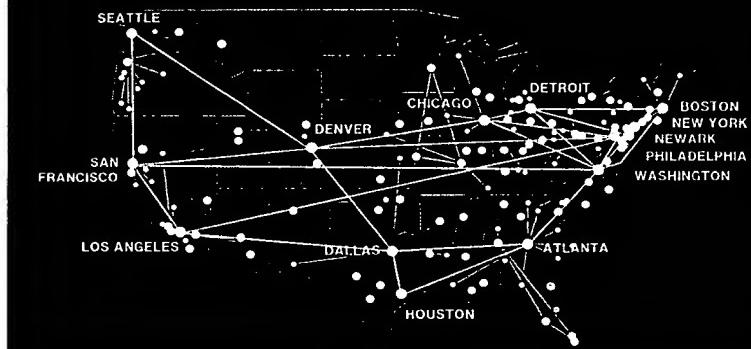
*Terminal users use dial-up or leased lines to access the Public Network through the local TCO.*

*GTE Telenet's switching centers house TP3000 and TP4000 equipment, specifically designed for high-speed terminal and host traffic.*

*The Telenet Central Offices (TCOs) are strategically placed in major cities which are selected on the basis of population and geographic coverage.*



## GTE TELENET NETWORK



# Cost-Savings Options

Using GTE Telenet's Public Network means no capital investment in costly network equipment. Once connected, costs are dependent on a customer's particular application, volume and speed of traffic. Since network interface equipment is modularly priced, users pay only for what they need, not excess capacity.

Telenet's packet-switching solution to data communications allows users to share transmission facilities. One user's peak hour, day, or season differs from another's. The flexibility inherent in the Public Network allows all users to efficiently handle peak traffic loads, while paying only for actual use.

Depending on the type of access method chosen, GTE Telenet offers a variety of discounts and special services to help cut down on monthly network costs. Further savings are available through outright purchase of on-site interface equipment.

## Extended Term Arrangements

A one- or two-year contract allows users to receive fixed monthly discounts on charges for GTE Telenet processors, dedicated access facilities, and dial-in access to help control rising communication costs.

## Volume Discount Plan

Depending on the number of dial hours or kilopackets per month, it is possible to cut costs with volume discounts and still apply extended term discounts.

## Time-of-Day Pricing

Network usage during off-peak hours on weekdays, all day weekends, and holidays can save as much as 50% on traffic charges and public dial hours.

## Transaction Processing Network Service

A special rate is available for transaction-oriented data processing applications which involve short duration calls. Typical applications include credit verification, check guarantees and electronic funds transfer.

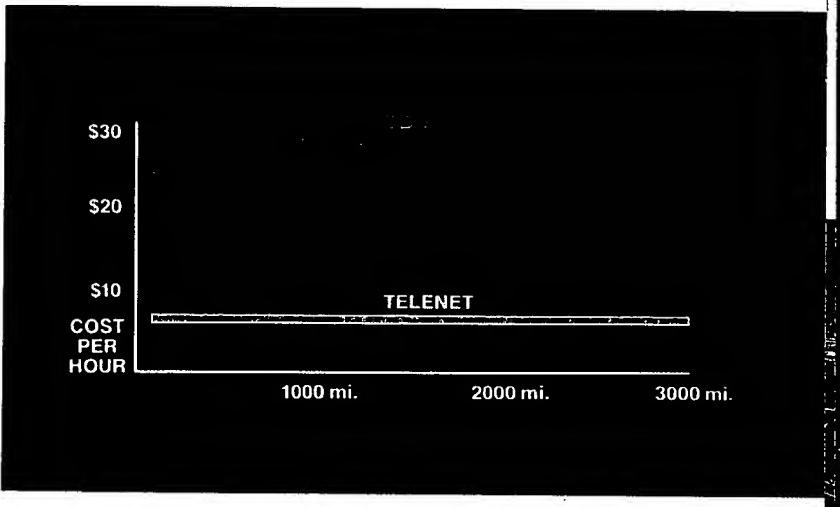
## Detailed Accounting Reports

Customers whose accounting requirements include in-depth analysis and monitoring of network usage can purchase Telenet's detailed connection reports as supplements to their regular monthly invoice. Detailed connection reports list network connections on a call-by-call basis and provide a valuable tool in tailoring network usage.



*GTE Telenet sales representatives and systems engineers work closely with customers to plan the most cost-effective hardware and software network interface.*

*A cost comparison between GTE Telenet's Public Network and other options such as WATS or long distance dial shows the savings, especially over long distances.*



# How the Network Operates

6

GTE Telenet has perfected the Public Network architecture into what is termed a "fourth generation" network. This simply means that the network is free standing and can switch independently between hosts, support various protocols, and efficiently use available bandwidths. GTE Telenet's family of communications processors are specifically designed for this type of distributed, multi-user data network.

Another important aspect of the Public Network operation is the segregation of the switching, concentration and management functions to improve network performance. The GTE Telenet network architecture also allows for easy expansion and maintenance of components.

## Network Access and Concentration

As stated earlier, connecting to the Public Network requires no fundamental changes to existing equipment. The network's ability to convert speeds, protocols, and codes lies in our TP3000 and TP4000 microprocessors specifically designed for packet-switching.

These concentrators convert data into X.25 and support a variety of other communications protocols such as BSC, HDLC, 3270 and 2780/3780. The 3270 network access interface provides full switching capability among terminal clusters and any number of 3270-compatible host computers. This allows terminal users to access data bases and application programs quickly and efficiently.

## Network Switching

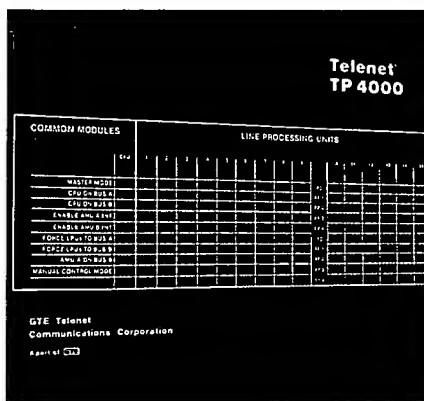
The Public Network is made up of a backbone network of switching centers, connected by trunklines which operate at speeds up to 56 Kbps. For high reliability, there are at least

three trunklines connecting each node to an adjacent one.

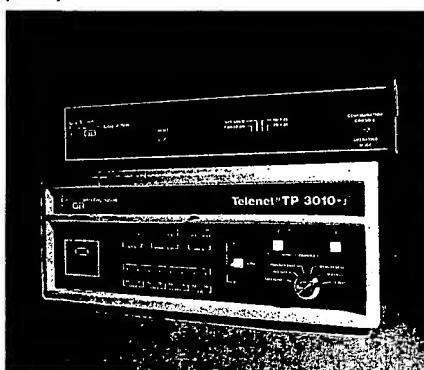
Each trunkline is logically independent of all other lines in terms of transmission speed, transmission mode, and data link protocol. This type of network configuration assures continuing service should a backbone line fail. Each node forms the hub of an efficient local distribution network, linking other access and switching centers in outlying cities at speeds up to 16 Kbps.

The redundant TP4000 switches used in our Public Network switching centers prevent the likelihood of a major network outage. These network switches set up calls, route traffic, and provide accounting and statistical reporting. Through dynamic alternate routing, data is automatically rerouted around failed switches. Routing control of user data is distributed in the network switches. No reliance is placed on a central control computer to establish or monitor connections.

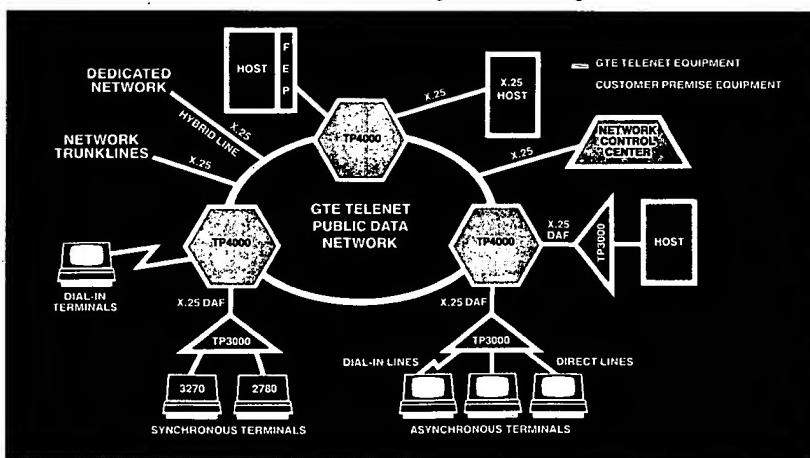
Powerful error detection and correction techniques assure relatively error-free transmission of data. In quantitative terms, undetected errors in the backbone network are about one in every  $10^9$  bits of data transmitted.



Front control panel (above) of powerful TP4000 packet switch. TP3005 and TP3010-II network interface processors (below).



The TP4000s shown in the network diagram below handle traffic from remote TCOs, public dial-in users, and customer host computer systems. Regionally organized TCOs connected to a hub route traffic through the hub for long-haul transmission.



# What Sets Telenet Apart

7

## *Network Management*

The feature that makes the GTE Telenet Public Network unique is its comprehensive network management capability. Our Network Control Center (NCC) continually monitors the status of the entire network including related subscriber equipment and lines. The NCC commands all of the diagnostic and maintenance resources needed to keep the Public Network running smoothly. It is the key to GTE Telenet's early warning system which detects potential problems before they affect a customer's computer operations.

From this central control point, the NCC staff can diagnose equipment problems at the customer site and, if necessary, initiate corrective action through remote software control of network processors and communications lines.

Another function of the NCC is the collection of detailed statistical and accounting data from the network nodes. This information is useful to customers in planning cost-effective network usage.

In addition to a broad spectrum of network management capabilities, GTE Telenet offers the essential elements of customer service and support.

## *Customer Service*

GTE Telenet's Customer Service group is available around the clock and can be reached by toll-free telephone to assist a user's computer center staff. Once a problem is identified, Customer Service can pinpoint and resolve it or dispatch a field engineer to the site.

## *Field Service*

The Network Control Center is backed by a nationwide field service organization which is strategically located to provide maximum coverage. Field service engineers are available to perform routine installation and on-site hardware maintenance when required.

## *Accounting Services*

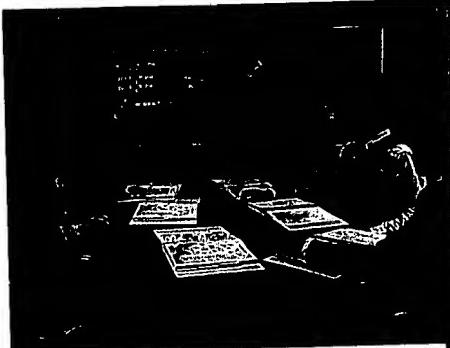
GTE Telenet relieves your company of the routine accounting needed to analyze remote computer usage or allocate communication costs. Monthly detailed connection reports break down billing and traffic information by city, user, time of connection and traffic charges.

## *National Accounts Program*

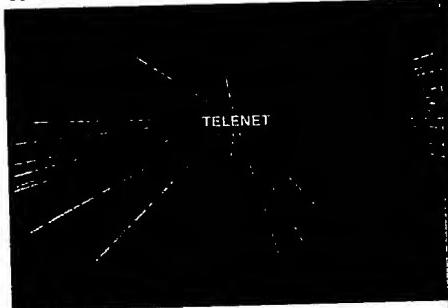
Organizations with multiple locations and high usage volumes receive the specialized services of our National Accounts staff. Realizing that large organizations have diverse communication needs, National Accounts works closely with other GTE entities to provide a totally integrated system which combines voice and data capabilities.

## *Worldwide Support*

GTE Telenet maintains sales offices in major cities across the country. Customers can call on our local staff of sales representatives and systems engineers at any time for communications planning and technical consultation. Internationally, our chain of distributors provides installation and maintenance service to customers with multinational communication systems.



*Customers learn how to manage their daily network operations through Telenet's comprehensive training program, often conducted on-site.*



*GTE Telenet Interconnects with similar networks in 50 foreign countries, some through our own International record carrier facilities.*

*GTE Telenet's Network Control Center, located in Vienna, Virginia, monitors switching centers, host sites and transmission lines 24 hours a day.*



# More About GTE Telenet

8

GTE Telenet Communications Corporation has been a leader in the design and development of packet-switching networks for the last decade. Our Public Network, the largest of its kind in the world, has been in operation since 1975. We pioneered the use of packet-switching, the most efficient form of electronic data transmission available today. We're leaders in developing communications standards such as CCITT X.25.

GTE Telenet's Public Network is the vehicle for a number of other innovative products and services such as:

- **Telemail<sup>SM</sup>**—a computer-based electronic message service, the first of GTE Telenet's series of office automation products.
- **MICRO-FONE<sup>®</sup>**—a combination data terminal and telephone used for voice and data transaction applications.
- **MINET<sup>SM</sup>**—an electronic medical information system for providing health care data to medical professionals.

Our years of experience with the Public Network have enabled us to assist large corporations, foreign administrations, and common carriers in implementing their own dedicated networks. Dedicated or private networks offer the most cost-effective solution for high-volume users with concentrated traffic and the need for direct user control. Norway, Australia, Mexico, Chile, and the United Kingdom, among others, have patterned their nationwide packet-switching networks after the GTE Telenet Public Network.

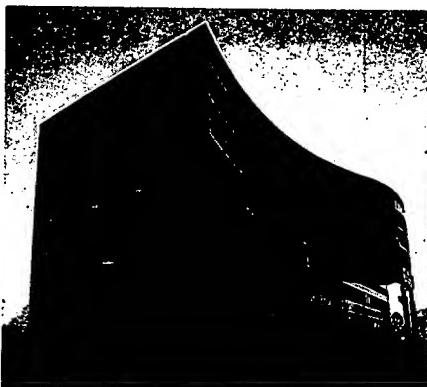
GTE Telenet became part of the GTE communications family in 1979. Telenet is joined by three other major groups within GTE: Telephone Operations, Communications Products, and Electrical Products. In addition to operating a nationwide Public Network, GTE

Telenet also provides data base and communications services for investment and brokerage businesses through its subsidiary, GTE Telenet Information Services.

As part of GTE, Telenet is backed by one of the world's leading suppliers of communications and electronics products and services. GTE Corporation is advancing satellite transmission, fiber optics, and voice/data PABX as the communications media of the 1980s.

The migration to integrated voice/data services will be enhanced further by the launch of GTE's GSTAR satellite in 1984. Designed by the GTE Satellite Corporation, this 12/14 GHz system will provide voice, image and data intercity communications to all 50 states.

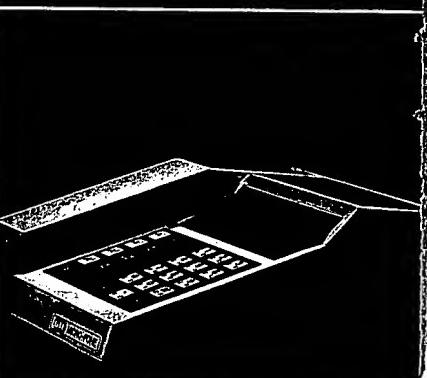
GTE Telenet will play a pivotal role in integrating these advanced technologies into future network products and services.



*GTE Telenet headquarters in Vienna, Virginia is the focal point for administrative, marketing, development, and operation activities.*



*The Public Network serves as a foundation for enhanced products and services such as Telemail (right), the Micro-Fone data terminal (corner), and the MINET medical information network (below).*



**GTE Telenet Regional Sales Offices**

**FEDERAL REGION**  
1700 N. Moore Street  
Suite 1710  
Arlington, VA 22209  
(703) 243-7510

**EASTERN REGION**  
120 Route 17 North  
Paramus, NJ 07652  
(201) 967-9000

**WESTERN REGION**  
2 North La Salle Street  
Suite 2107  
Chicago, IL 60602  
(312) 782-6119

**GTE Telenet Communications Corporation**  
8229 Boone Boulevard, Vienna, VA 22180  
(800) 835-3638 or (800) T-E-L-E-N-E-T

© 1983 GTE Telenet Communications Corporation

D

## Premastering/Post Production Procedures for Scotch Videodiscs



## Premastering/Post Production Procedures for Scotch Videodiscs

---

Optical Recording Project/3M  
223-5S 3M Center  
St. Paul, MN 55144

**3M**

©1981, Minnesota Mining and Mfg. Co.  
All rights reserved. This manual nor any part thereof  
may not be reproduced without written permission of  
3M Company.

# Contents

■ Foreword to Premastering Facilities .....	vi
<b>1 General Background</b>	
Optical Videodiscs .....	1
Constant Angular Velocity (CAV) .....	1
Play Features:	
still frame; freeze frame; step frame; slow motion; fast motion; scan; search; non-linear play; frame address; chapters; picture stops and still pictures; dual-channel audio	
Constant Linear Velocity (CLV) .....	3
Levels of Interaction .....	4
Field Dominance and Flicker .....	4
<b>2 Format Requirements for Program Production</b>	
Preferred Formats for Original-Source Material .....	8
Alternative Formats .....	8
<b>3 Preparing the Premaster Tape (Premastering)</b>	
A. Premaster Tape Specifications	
General Specifications .....	9
Program Specifications .....	9
B. Procedures for Transferring Media to Premaster Tape	
Video Tape to Premaster Tape - Linear Play	
(CLV) Only .....	10
Motion Picture Film to Premaster Tape - Linear	
Play (CLV) Only .....	10
Video Tape to Premaster Tape with Frame	
Accuracy - CAV .....	10
Cues and the 3M Cue Inserter .....	10
Motion Picture Film to Premaster Tape with Frame	
Accuracy - CAV .....	10
1) Film Shot at 24 frames per second .....	11
Methods of Field/Frame	
Synchronization .....	11
2) Film Shot at 30 frames per second .....	12
Transferring Slides to Premaster Tape .....	13
Transferring Other Media to Premaster Tape .....	13

# Contents (continued)

## 4. Use of the Cue Inserter

A. Formatting of CAV Discs	
Premaster Tapes without Cues .....	14
Premaster Tapes with Cues .....	15
B. When to Use the Cue Inserter .....	15
C. How Cues Work .....	15
Picture Cues .....	16
Chapter Cues .....	16
Still Cues .....	17
3M Cue Inserter Specifications .....	17
D. Modes of Operation with Video Tape .....	18
Manual Mode .....	18
Inserting Picture Cues .....	18
Inserting Chapter Cues .....	18
Inserting Still Cues .....	19
Examples and Implications .....	19
Tapes with Consistent Field Dominance .....	20
Tapes with Inconsistent Field Dominance .....	20
Automatic Mode .....	21
Inserting Pictures Cues .....	21
Inserting Chapter Cues .....	21
Inserting Still Cues .....	22
E. Cue Insertion with Film .....	22
Inserting Picture Cues .....	22
Inserting Chapter and Still Cues .....	23

## ■ Appendix

A. Diagram of Specifications for Premaster Tapes	
B. Forms and Checklists	
Final Checklist for Premaster Tapes	
Scotch Videodisc Post Production Details	
C. Schematics - Use of the 3M Cue Inserter	
D. Technique for Determining Field Dominance	

## List of Tables and Illustrations

Stages of Videodisc Production.....	vii
Figure 1.1. Format of a CAV Disc.....	1
Table 1.1. Methods of Control for Play Capabilities of Laser Disc Players.....	2
Figure 1.2. Format of a CLV Disc.....	4
1.3 Flicker Resulting from Mismatched Fields.....	5
1.4A Disc Frames Correctly Formatted from Premaster Tapes.....	6
1.4B Mismatching of Fields Occurs When Field Dominance is Incorrectly Specified.....	6
1.5 Mismatching Occurs When Field Dominance Changes Between Segments.....	7
1.6 Cue Insertion Can Prevent Mismatching of Fields When Field Dominance Changes in the Premaster Tape.....	7
3.1 Format of a CAV Disc.....	10
3.2A Different Rates of Motion for Video Tape and Film Shot at 24 Frames per Second.....	11
3.2B Sequence of Film Frames and Video Fields Resulting from 3-2 Pulldown Transfers.....	11
3.2C Pattern of "Good" and "Bad" Frames Resulting from 3-2 Pulldown Transfer.....	11
3.2D 3-2 Pulldown with Cues Inserted on Premaster Tape.....	12
3.3A Results of 3-2 Pulldown When No Cues Are Inserted on Premaster Tape.....	12
3.3B 3-2 Pulldown Without Cues Inserted: Images Are Repeated on Three Consecutive Frames to Avoid Flicker.....	12
3.4A Mismatched Fields May Also Occur When Original-Source Material is Shot on Film at 30 fps.....	13
3.4B Proper Relationship of Field Dominance and Edit Points Eliminates Mismatching.....	13
4.1 How the Disc-mastering Equipment Reads Premaster Tapes That do not Have Cues.....	14
Table 4.2 Location of Address Codes in the Vertical Intervals of a Disc.....	14
Figure 4.3 How the Disc-mastering Equipment Reads Premaster Tapes with Cues.....	15
4.4A Location of Cues in the Vertical Interval of the Premaster Tape.....	15
4.4B Pulse Train Specifications for Cues on the Premaster Tape.....	16
4.5A Location of the Picture Cue.....	16
4.5B Location of the Chapter Cues.....	16
4.5C Location of the Still Cue.....	17
4.6 3M Cue Inserter.....	17
4.7A& Procedure for Manual Insertion of Cues.....	18
4.7B	
4.8 Three Tape Segments to be Edited Together and Cued.....	19
4.9A- Sample Procedure for Editing and Manual Cue Insertion.....	19-20
4.9G	
4.10 Picture Cues Inserted to Remedy Inconsistent Field Dominance.....	21
4.11 Bad Frames Occur at Edit Points if a Field is Inadvertently Dropped.....	21
4.12 Video Tape with Picture Cues Applied During Pulldown.....	22
4.13 Complications Arise in Editing Tape Cued During 3-2 Pulldown.....	23

## Foreword to Premastering/Post Production Facilities

Please read this manual *carefully*. It contains information essential to the correct preparation of program material for replication of 3M Scotch videodiscs.

The production of optical videodiscs is a demanding and exacting process that requires good teamwork at each stage—from the earliest conception and planning through production to post production, premastering and replication. Top quality is attainable through careful attention to detail.

We at 3M see the production of an optical videodisc as a process occurring in three distinct phases. (Please see the table, opposite.) Phase I, or *program design/production*, includes the defining of program objectives, the preparation of a script, the plotting of a flowchart for interactive disc programs, the storyboarding of picture and sound sequences, and the taping or filming of the program. These steps are covered in detail in a 3M learning module called "Producing Interactive Videodiscs," which is available for sale through your 3M sales representative or the sales office of the Optical Recording Project in St. Paul, Minnesota.

Phase II is *post production/premastering*. It involves the preparation of the video tape that must be submitted to 3M for mastering and replication. Premastering includes the transfer of program material from tape, film or slides to video tape. It involves color and contrast correction, cue insertion and editing. These steps may be the responsibility of the end-user, the production studio, or the premastering facility.

Phase III is the mastering and replication of the final disc. 3M checks the premaster tape for adherence to published specifications. It then makes a master disc from the tape; replicates the master disc in the quantity the customer has ordered; checks the discs for conformance to specifications; packages them; and delivers them to the customer.

Although 3M is directly involved in Phase III, we are indirectly your partner in Phase II as well. This is because successful replication depends, in part, on the care that has gone into the preceding steps.

3M has developed a sophisticated technology that assures high-quality mastering and replication in an ultra-clean environment, with state-of-the-art automated equipment. Because of the precision of our computerized system, our specifications must be followed exactly. They are not approximations or guidelines—they are requirements without which satisfactory mastering cannot be assured. Tapes not meeting 3M specifications must be corrected before videodiscs will be produced.

This manual, then, is addressed to the premastering/post production staff to help ensure that a minimum of time and expense are consumed in the premastering and manufacturing stages. It is intended to help both you and 3M return top-quality videodiscs to satisfied customers with minimum cost and delay.

Since the making of videodiscs involves relatively new and perhaps unfamiliar processes, questions will invariably arise. We at 3M will do our best to make our technical resources available to you to produce discs of consistently high quality. We urge you to direct your questions to Technical Service, Optical Recording Project, St. Paul, Minnesota, at 612/733-9563 or 733-7558.

## Foreword

### Stages of Videodisc Production

Phase	Responsibility
Phase I. Program Design/Production Instructional Design	End user, production studio or freelance
Storyboarding Flowcharting Scripting Shooting	
Phase II. Premastering	End user, production studio or post production facility
Editing Color balance Transferring to premaster tape Inserting cues	
Phase III. Mastering and Replication	3M
Checking specifications of premaster tape Making the master disc Making replicates Packaging and labeling Final quality check	

# 1. General Background

## Optical Videodiscs

The information in optical videodiscs is encoded in the form of microscopic pits pressed into a spiral configuration in the disc surface. Information stored in these pits is "read" by a laser beam and transmitted to a decoder in the player. A 360-degree segment of the spiral is called a *track*.

Scotch reflective videodiscs contain their information on reflective surfaces sandwiched between layers of acrylate plastic. The shiny disc surface reflects the laser light to a mirror, which in turn reflects it to a decoder. Because the pits are contained beneath a protective surface, the laser disc is less susceptible to dirt and superficial scratches than capacitance disc formats. Reflective discs must be turned over in order to read information on both sides.

## Constant Angular Velocity (CAV)

Constant Angular Velocity (CAV) is a disc format in which each track contains two video fields that comprise one complete video frame. The disc is played at a constant rate of 1800 rpm to achieve 30 frames per second (fps) of play for the NTSC standard.

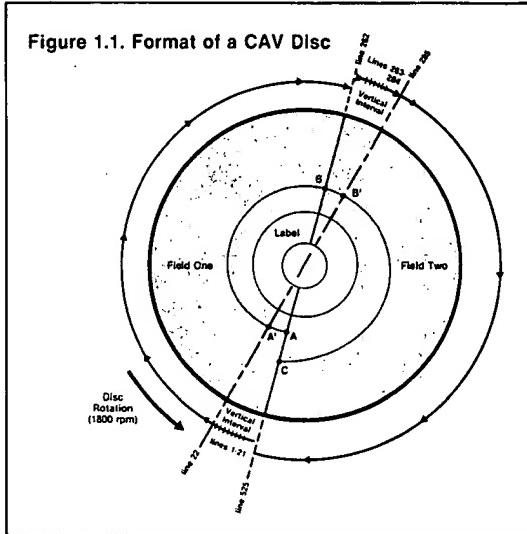
As many as 54,000 frames can be mastered on each side of a CAV disc, allowing as much as 30 minutes per side of uninterrupted play. Figure 1.1 shows one CAV frame on a spiral track beginning at Point A and ending at Point C.

The wedge-shaped portions of field one and field two are the vertical intervals. The player would begin reading the disc frame at Point A. When it reaches Point A' it has read line 21 of the vertical interval and is ready to begin reading the video program in field one, which begins on line 22 and runs through line 262. In normal play it then reads field two of the disc frame, starting at Point B. It first reads the vertical interval (lines 263 to 284) between points B and B'. The laser then completes the frame by reading the video program on lines 285-525. When it reaches Point C it proceeds outward on the spiral track to the next frame. This is the typical program sequence for linear play.

But each time the laser finishes reading the information in a video field, it can be commanded either to go on to the next field or else jump inward or outward to fields on adjacent tracks. This capability allows the videodisc player to read information in ways that are impossible with videotape.

**Still Frame, Freeze Frame.** Videodisc players can create still pictures from any of the 54,000 frames by repeating the same tracks on the disc rather than going on to the next. Each track on a CAV disc contains one video picture, so repetition of a track results in the continuous presentation of a still frame or a freeze frame.

Figure 1.1. Format of a CAV Disc



A freeze frame effect is caused when the action is stopped in one among many frames of a motion sequence. A still frame may be a single frame designed specifically for use in the still frame mode of play (such as text, art or still photographs). Or it may consist of a series of identical frames from a single non-action image. (This latter effect occurs in motion picture work when a camera card or a slide is shot for the length of time it is needed on the screen.)

Because nothing but a beam of light comes into contact with the disc surface during play, one frame can be displayed indefinitely with no harm to either player or disc.

**Step Frame.** Optical videodisc players also permit the program to be viewed at various rates of motion. Step motion results when the user commands the player to move from one freeze frame to the next. The player repeats one track of the disc until it is given a command to move on to the next frame and repeat it. Step motion can occur in forward or reverse.

**Slow Motion.** In slow motion play, the player repeats a frame a specific number of times before moving on to the next frame automatically. The rate of slow motion is determined by the number of times each frame is repeated. On most optical players the user can control the rate along a continuum ranging from normal speed to something akin to step motion. It can occur in forward or reverse.

# General Background

**Fast Motion.** Some players can also create the effect of fast motion, up to as much as two to three times normal speed. In the fast motion mode, the player may read only one field of a frame before moving on to the next frame. Fast motion can be played in either forward or reverse.

**Scan.** In the scan mode, the player skips over several tracks at a time, displaying only a fraction of the frames it passes. It is analogous to skimming through a book. Scanning can also be done in either forward or reverse.

**Search.** Besides normal play and scanning, a third method of gaining access to the program on a videodisc is made possible through the search—or random access—function. Most players have input keys on the machine itself or on a remote control keypad. By entering the number of the frame desired, the user can locate it with pinpoint accuracy in seconds.

**Non-linear Play.** The fast accessibility of any frame on a disc side allows the program on the disc to be read in a non-linear fashion. This means the information can be read in a sequence other than the one in which it was recorded on the disc.

**Frame Address.** Each frame has an address or frame number analogous to a page number in a book. These numbers may or may not be displayed on the television screen, depending on the user's preferences and the ways in which the program is to be used. A *frame address* is put on each disc frame in the form of a *frame address code*. The code is located in the vertical interval between video fields.

**Chapters.** Some videodisc systems (Table 1.1) allow manual access to entire disc segments called *chapters*. *Chapter number codes* are placed in the vertical intervals between the video program in field one and field two, allowing *chapter numbers* to be displayed on the screen during play.

Table 1.1 Methods of Control for Play Capabilities of Leading Optical Videodisc Players

Capabilities	still frame, freeze frame	step frame	fast motion	scan/ search	chapter search/ stop	automatic stops on specific frames	slow motion	dual-channel/ stereo audio
<b>Players</b>								
DVA PR-7810 & Pioneer VP-1000 (consumer type)	M	M, F&R	M, F&R	M, F&R	MC*	MC*	M, F&R (variable)	both
Pioneer DVA PR-7820 series (programmable industrial type)	M	M, F&R	NA	M, P	NA	P	M, F&R (variable)	both
Magnavox 8000 (consumer type)	M	M, F&R	M, F	M	MC	MC**	M (variable)	both
Magnavox 8005 (consumer type)	M	M, F&R	M, F	M	MC	MC	M (variable)	both
Magnavox VC8010GY, Sylvania 7200 (consumer type)	M	M, F&R	M, F&R X3	M, F&R	MC	MC	M, F&R variable	both CX
Pioneer LD-1100 (consumer type)	M	M, F&R	M, F&R X3	M, F&R	MC	MC	M, F&R variable	both CX
Pioneer PR-8210 (industrial type)	M	M, F&R	M, F&R X3	M, F&R	MC	MC	M, F&R variable	both CX
Sony LDP-1000 (programmable industrial type)	M	M, F&R	M, F&R P	M, P	P	P	M, F&R (variable) P	both

KEY: M: controlled through manual entry of command on the player keypad

P: controlled through the player's built-in microprocessor

MC: controlled manually, when codes are on the disc

NA: not available

CX: CX noise reduction if disc is encoded with CX

\*works only when frame number is displayed

\*\*only on modified players

F: forward R: reverse

## General Background

When a disc contains chapter number codes, some models of disc players can be made to proceed automatically to the beginning of a chapter. A disc player can arrive at the beginning of a chapter in either of two ways:

1. **Scan mode.** In the scan mode, the disc player moves quickly through the program by skipping tracks. In order to make sure the scanning player detects the transition as it skips from one chapter to the next, a chapter stop code is placed on the first 400 frames of each chapter. Program designers should allow a 300- to 400-frame "window" at the beginning of each chapter. The window, for example, may consist of a title frame repeated over 400 frames, with musical theme recorded in audio. This helps ensure that no essential video or audio content would be missed if the player were to stop at the 250th frame of the chapter instead of the tenth. A window, then, is a segment into which the user may enter at any point without missing essential content at the beginning of a chapter.

Note: Some players were incapable of arriving at chapters in random order. They could only advance to the beginning of the next chapter in sequence, using a control that was then labeled "search." This function is now referred to as "scan" by all player manufacturers.

2. **Search mode.** When the player is operating in the chapter search mode, it follows a different procedure that allows it to stop on the very first frame of any chapter on a disc side, in or out of sequence. When a disc player receives a chapter search command, it first determines which chapter it is in at the moment, and then it advances or reverses the movement of the laser until it has located the first frame of the chapter it seeks. Because disc players can search to the very first frame of the chapter, a chapter window may not be necessary. Windows are needed only if the designer wants the user to be able to *both* search and scan to the beginnings of chapters.

Other important design considerations relate to the length and numbering of disc chapters. It is recommended that no chapter be less than 30 video frames long. Chapters may be numbered from 0 to 79, inclusive. A disc side may begin with any chapter

number the designer indicates; all subsequent chapters on the side will then be numbered consecutively, in increasing order from program beginning to end. If chapters are to be used on a disc side, all segments of that side must contain chapter number codes. This means that even introductory material on a chapterized disc side must also bear a chapter number. Chapter zero is often used for this purpose.

**Picture Stops or Still Pictures.** Certain systems (Table 1.1) can also read *picture stop codes* or *still codes* to make the player stop automatically on a specific frame during play. Since picture stop codes are intended to be read while the player is operating in the normal play mode, the signal is encoded on only one disc frame. The picture stop function allows the videodisc designer to integrate motion and still sequences without requiring user input between them.

**Dual-Channel Audio.** All optical videodisc systems are capable of reproducing dual-channel audio. The two audio channels can be played simultaneously or individually. High-fidelity stereo sound can be reproduced when the two channels are played together; but if stereo is not necessary each channel can contain different information—such as narration in different languages or explanations at different levels of difficulty for a variety of audiences.

### Constant Linear Velocity (CLV)

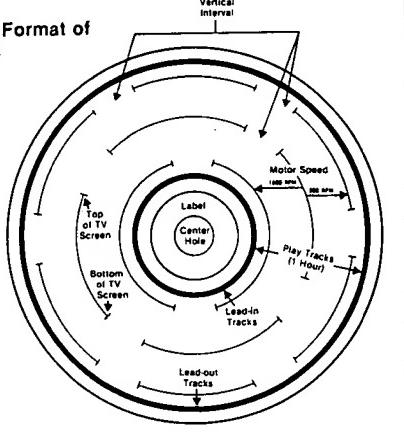
Constant Linear Velocity (CLV) is an alternative format for increasing the capacity of a laser disc. It allows twice as much play time per disc side, but its disadvantage is that many of the user-control capabilities of the CAV format are forfeited.

The CLV disc can be read in linear play only. It plays in forward and scans in either forward or reverse. It can be played with dual-channel audio or stereo, and chapters can be encoded as with CAV format videodiscs. Players can search to the beginnings of chapters in any sequence on a CLV disc. To search a location on a CLV disc, elapsed time is displayed rather than frame numbers as on a CAV disc.

CLV elapsed program time can be shown in hours and minutes. This time may run from 0:00 to nine hours. If the program designer wants a disc side to begin at other than 0:00, this time should be indicated on the Post Production Details form. (See Appendix for sample.)

# General Background

Figure 1.2. Format of a CLV Disc



In CLV play the disc speed varies from 1800 rpm at the inside radius to 600 rpm at the outer edge. Because more than one frame may be recorded on each track (Figure 1.2), playing time can be extended to as much as one hour per disc side.

Since one spiral track may contain more than one video frame, however, it is impossible for the laser beam to isolate a single frame on a single track. Thus the configuration of a CLV disc does not allow it to be played with freeze frames, step motion, slow motion, frame searches or picture stops.

## Levels of Interaction

Interaction results from the user's ability to change the sequence of program material to suit his or her own needs and interests. Four distinct levels of interaction are possible, depending on the format of the disc, the mode of play and the type of hardware with which the disc is viewed.

**Basic Level.** The basic level videodisc system is one that plays video information in a linear sequence, in either the CAV or CLV format. It starts at the beginning, progresses through the middle and finishes at the end.

**Level One.** At Level One, interaction is limited to simple play modes the user can command through the control panel on the player or the keypad. The user can go directly to any chapter or frame desired. He or she can command step motion, freeze framing, forward and reverse play, scanning, and fast play or slow motion. The player can also be made to stop automatically when it comes to picture stop codes or chapter stop codes on the disc.

**Level Two.** Level Two interaction is made possible through the use of industrial or educational videodisc systems containing programmable microprocessors. Predetermined computer programs can be entered into the player's memory either manually (through the keypad) or else by digital codes carried on the disc itself.

Programming through the remote control pad can be time consuming, and the disc player must be reprogrammed each time it is used with a different disc program.

When the program is carried on the disc itself, digital program codes are carried in audio channel two and (if that channel is on) are automatically dumped into the player's microprocessor each time the disc is played. Because the microprocessor generally has limited memory capacity (about 1K or 1000 bytes) complex programs may have to be dumped in more than one step during the course of a disc program.

Some Level Two systems do not read chapter stop codes or picture stop codes, but the players' memories can be programmed so that the disc will play through a motion sequence and then stop automatically on a predetermined frame. Single-frame sequences can also be programmed so that each frame remains on the screen for a specified length of time before the player steps forward or back to the next frame.

**Level Three.** Level Three interaction offers still greater program potential and capability. At Level Three one or more disc players may be interfaced with an external computer. Because such computers have greater memory capacity, programs can be made quite complex, with the computer logging the user's responses for testing, market research and the like. A keyboard allows the user to perform mathematical problems, respond to open-ended questions or address the computer in complete sentences. Light pens, paddles, joy sticks, touch screens, voice recognition and other devices can be used for input. The players, the computer and the program must all be compatible and properly interfaced.

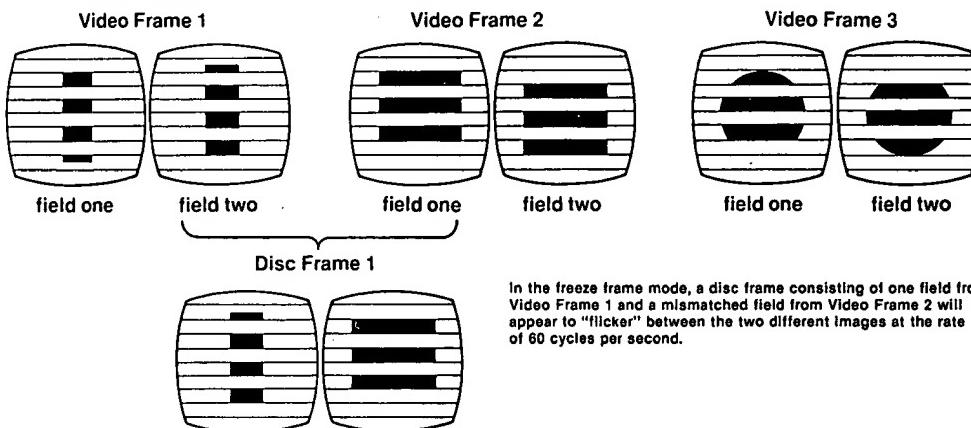
## Field Dominance and Flicker

A video frame is made up of two interlacing fields, one following a sixtieth of a second behind the other. Field one consists of lines 1 to 262, with lines 1 to 21 for the vertical interval and lines 22 to 262 for program video. Field two consists of lines 263 to 525, with lines 263 to 284 for the vertical interval and lines 284 to 525 for program video.

In most previous uses of video tape, it has mattered little whether field one precedes field two or vice-versa—the constant, uninterrupted alternation of fields creates an appearance of smooth flow from picture to picture.

## General Background

Figure 1.3. Flicker Resulting from Mismatched Fields



But videodisc players can be instructed to interrupt motion sequences and continuously reread a single frame. When the videodisc player stops on a frame containing fields recorded from different pictures, a disturbing effect known as *flicker* or *jitter* is created on the television screen. Flicker is the appearance of jumping between two different pictures; it occurs at 60 cycles per second.

There are two kinds of flicker. The first—*video flicker*—occurs when motion sequences are originally shot on video tape. If the subject moves during the sixtieth-second interval between one field and the next, it will appear to flicker between its position as recorded in the first field and its position as recorded in the second. The greater the motion, the greater the flicker. The only ways to avoid video flicker are to shoot action sequences on motion picture film, or to use an electronic field interpolation system.

The second kind of flicker is caused by *mismatched fields*. It occurs when fields from two different video frames are read together as a single disc frame. (Figure 1.3) The only way to avoid mismatched fields is to pay careful attention to *field dominance*, or the order of video fields established on video tape during edits or transfers. A tape of field one dominance is one in which a new picture begins on field one (Figure 1.3); with field two dominance the new picture begins on field two. The field dominance of the premaster tape determines on which field the videodisc frames will begin.

In order to master the videodisc so that fields are properly matched, 3M must be provided correct information on field dominance for all discs in the CAV format.

The combining of properly matched fields into "good" disc frames is controlled by codes placed in lines 10, 11, 17 and 18 or 273, 274, 280 and 281 of the disc's vertical intervals during the disc-mastering process. These codes tell the disc player which two fields should be read together as a single video frame.

When the mastering equipment is set for field one dominance, it examines the composite video signals as the premaster tape passes by. Each time it identifies the passage of a field one, it puts a code on lines 10, 11, 17 and 18 of the disc's vertical interval. These frame identification codes will tell the disc player the number of the frame it is reading and will instruct it to read two fields together as a single frame. Conversely, when the disc-mastering equipment is set for field two dominance, it encodes this information on lines 273, 274, 280 and 281 in the vertical interval of field two of each disc frame.

Figure 1.4A, then, shows how tapes of field one and of field two dominance will be formatted on the disc, assuming 3M has been given correct information on field dominance. Stopping such a disc on any frame will result in an image with minimum flicker. Figure 1.4B shows what would happen if field dominance were incorrectly indicated.

Complications arise when a premaster tape changes field dominance at one or more points within the program. This may occur unwittingly. It happens most often when tape is edited on equipment incapable of frame-accurate editing or on equipment that has selectable field-accurate editing. When a tape has one segment with field one dominance and another with field two dominance, one of these segments (depending on how the mastering equipment is set) will have freeze frame flicker throughout.

## General Background

Figure 1.4A. Disc Frames Correctly Formatted from Premaster Tapes

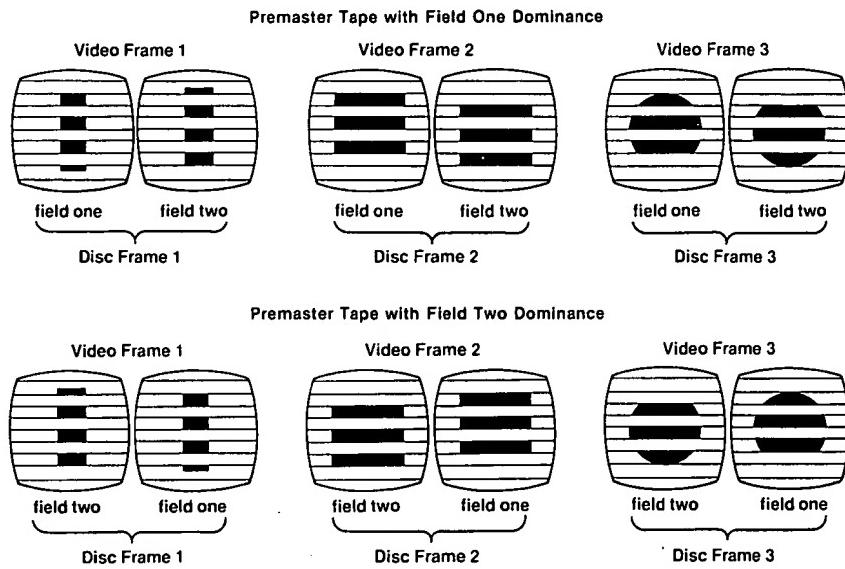
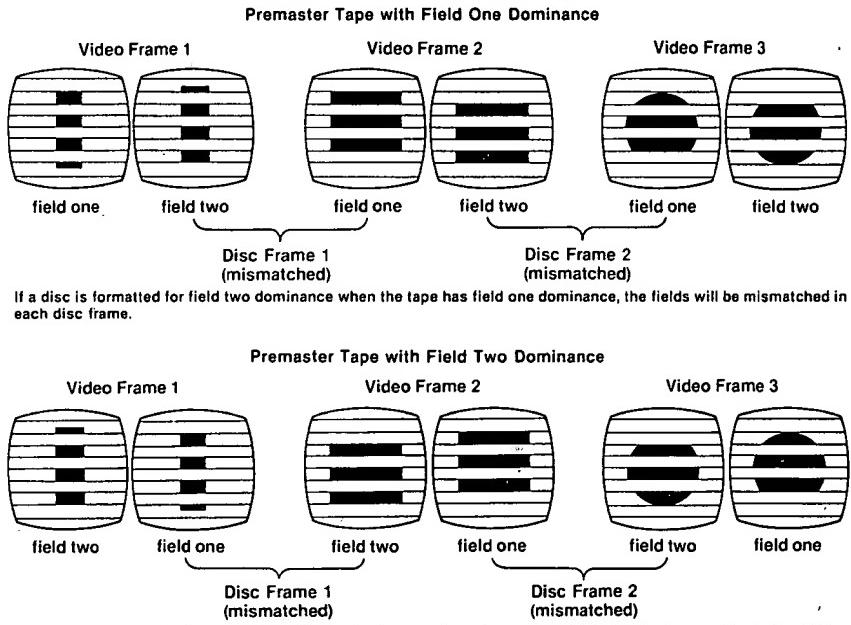


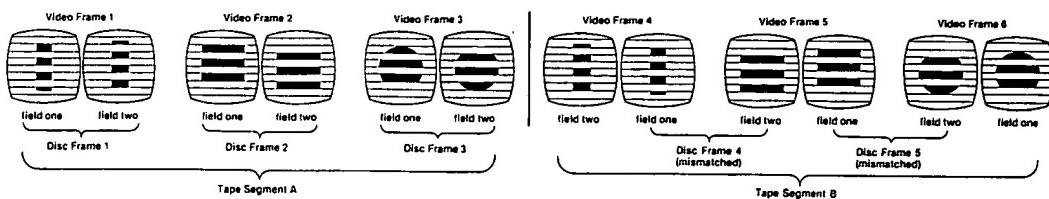
Figure 1.4B. Mismatching of Fields Occurs When Field Dominance is Incorrectly Specified



# General Background

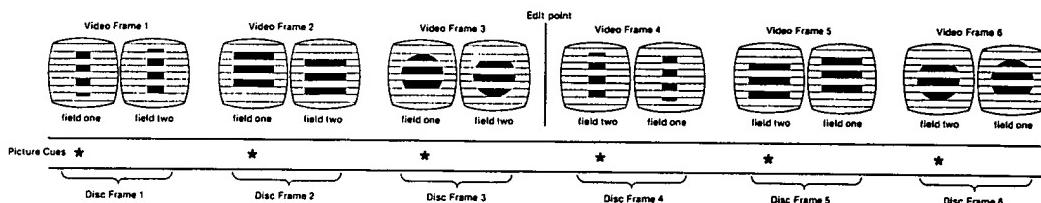
Figure 1.5. Mismatching Occurs When Field Dominance Changes Between Segments

Tape of field one dominance edited to tape of field two dominance.



If the disc-mastering equipment is set for field one dominance, all disc frames after the edit point will be subject to freeze frame flicker.

Figure 1.6. Cue Insertion Can Prevent Mismatching of Fields When Field Dominance Changes in the Premaster Tape



A segment of field one dominance is edited to a segment of field two dominance, with cues inserted on both segments. The disc-mastering equipment is set to read cues instead of fields in the composite video. Picture cues have been inserted to identify which field should receive the frame address code on the disc. The result is no mismatching of fields.

In Figure 1.5, Segment A with field one dominance is edited to Segment B with field two dominance. The edit point occurs between Video Frame 3 and Video Frame 4. If the disc-mastering equipment is set for field one dominance, note that all disc frames after the edit point will have mismatched fields from different video frames. The result is flicker.

This problem can be overcome through the use of a 3M Cue Inserter. (The applications of this device are more fully discussed in Section 4.)

Briefly, the cue inserter can place a cue on the premaster tape to tell the disc-mastering equipment in which field it should put the frame identification code on the disc. By reading these cues, the disc-mastering equipment is able to follow the field dominance format of the tape and repeat it on the disc. If cues are inserted in this way, the problem of flicker is minimized throughout the second tape segment in Figure 1.6.

A technique for checking field dominance on premaster tapes is described in the Appendix.

## 2. Format Requirements for Program Production

Original program material intended for optical videodisc mastering may be prepared in the form of slides, film, video tape or electronically generated graphics. But in order to be mastered in 3M's reflective videodisc formats, all program material *must first be transferred to 1-inch type C composite or 3/4-inch professional NTSC 525-line, 60Hz video tape.* One-inch premaster tapes result in discs with noticeably better image resolution than discs mastered from 3/4-inch professional premasters.

### Preferred Formats for Original-Source Material

Some media can be transferred to the premaster video tape with better results than others. The "preferred" formats listed below will produce the highest quality of transfer:

- 1-inch type C composite NTSC 525-line, 60Hz video tape
- 2-inch quad video tape
- 2-inch helical video tape
- 1-inch type B composite NTSC 525-line, 60Hz video tape
- 3/4-inch professional NTSC 60Hz video tape
- 35mm motion picture film\*
- 16mm motion picture film\*
- 35mm slide film
- electronically generated graphics

### Alternative Formats

The following formats will produce lower overall quality than the preferred formats:

- Super 8mm film  
(Limitation: inferior resolution and image stability. Conversion of 18 frames per second (fps) to 30 fps presents sound-synchronization problems.)
- All other consumer/amateur media  
(Limitations: Beta, VHS and other consumer media have inferior resolution and image stability.)

\*Please note that transfer of film shot at 24 frames per second involves complications that are covered in Section 3B, "Transferring Motion Picture Film to Video Tape with Frame Accuracy."

### 3. Preparing the Premaster Tape (Premastering)

The preparation of the premaster tape is an exacting process in which 3M's specifications must be followed precisely.

Please note that special considerations must be taken into account when program material shot in motion picture film is to be transferred to video tape. These are outlined in Section 3B under the title "Transferring Motion Picture Film to Video Tape with Frame Accuracy - CAV."

The Appendix includes a convenient diagrammatic summary of 3M's specifications for premaster tapes.

You may submit both sides of a two-sided program on the same premaster tape. If this is done, all the same specifications must be followed exactly as if you were submitting the two sides on separate premaster tapes. You must include additional leader before the color bars begin for the side two program. The SMPTE time code should begin anew during the side two lead-in, exactly as for side one.

#### 3A. Premaster Tape Specifications

*Tapes not meeting these specifications must be corrected by the premastering facility before they can be mastered.*

##### Premaster Tape Form

You will find in the Appendix of this manual a "Scotch Videodisc Post Production Details Form" and a "Final Checklist for Premaster Tape." One of each of these forms should be filled out completely and submitted with each program to be mastered.

##### General Specifications

Original-source program material may be video tape, still camera, electronic graphics or motion picture film. But it must be transferred to video tape in accordance with the following specs:

**Premaster video tape format:** 1-inch type C composite NTSC 525-line 60Hz, or 3/4-inch professional NTSC 525-line 60Hz tape.

**Time Code:** A SMPTE non-drop frame (or full-frame) time code is to be placed on the cue track (Channel 3 audio). It must be unique and sync-locked. The code must be continuous and always increasing, beginning with the color bars and running through the lead-out.

**Video:** The maximum luminance of the video signal must not exceed 110 IRE units. The color burst must be present even for black-and-white productions.

The chroma level must not exceed 100% modulation. The signal/noise ratio should be 45dB minimum unweighted, 10KHz to 4.2 MHz at 50 IRE units flat field level.

**Audio:** Audio channels are either monaural, dual-independent or stereo. For programs in mono sound, both tracks should be recorded with identical information. One-channel audio can be mastered onto both disc channels, but this service must be specifically requested.

Audio levels are to be consistent throughout the tape. The reference level is 0 VU, with short-term peaks not exceeding +3dB.

Stereo applications require certain precautions to be taken to ensure quality stereo performance. For both stereo and mono, channels should be in phase and balanced within 2dB of each other. Channel separation and equalization may vary, depending on how the program will be used. Harmonic distortion should be no greater than 1%, and signal noise should be greater than 56dB in a band width of 50Hz to 15Hz referenced to a 1KHz reference level. Please specify which tape audio channel (1 or 2) is to go on the disc's audio channels 1 and 2.

Please note also if different languages are recorded on the two channels.

Compression/expansion noise-reduction systems are currently being evaluated. Please consult your 3M representative before making commitments to specific systems.

##### Program Specifications (summarized in a diagram in the Appendix)

**Tape lead in, video:** The leader is followed by two minutes of color bar of 75% chroma with a known luminance reference. The color bars must then be followed by at least 40 seconds of video black. The video black forms part of the program lead-in on the disc.

**Audio:** At least one minute of tone at 1KHz and 0 VU must occur during the color bar. Dual-channel audio must have reference levels on both channels. Sound must be off during the video black.

**Tape lead-out:** A minimum of 30 seconds of video black with no audio must follow the active program.

**Active program:** The program length for each premaster tape cannot exceed the one-side capacity for CAV or CLV discs, which is 30 minutes and 60 minutes maximum, respectively.

The program beginning and end must be indicated on the "Post Production Details Form" by a SMPTE time code reference. Contact your 3M representative for more specific information.

# Premastering

## 3B. Procedures for Transferring Media to Premaster Tape

All transfers of other media to the premaster tape must be done in accordance with the specifications given in Section 3A.

Programs that require match-frame edits must conform to RS170A standards. Failure to do so may result in sideways jumping of the video image at edit points. This will be apparent in both CAV and CLV formats. Potential problems with adherence to RS170A can be minimized by routing all video sources through a common sync/subcarrier reference.

### Transferring Video Tape to Premaster Tape - Linear Play (CLV) Only

Cue insertion, frame accuracy and information on field dominance are not required for preparation of premaster tapes when discs are to be mastered in the CLV format.

### Transferring Motion Picture Film to Premaster Tape - Linear Play (CLV) Only

The procedure is basically the same as for the transfer of video tape for linear play (preceding paragraphs).

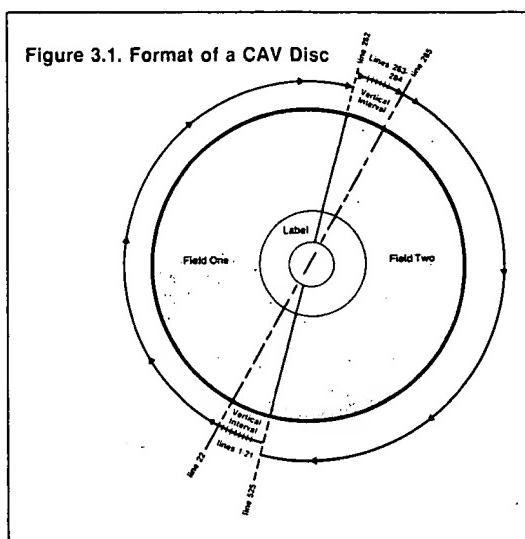
If video tape is used as an intermediate medium, standard care should be used with respect to edit points and color framing, as above.

### Transferring Video Tape to Premaster Tape with Frame Accuracy - CAV

For the production of videodiscs in the CAV format, production media should be transferred to the premaster video tape with frame accuracy. Without frame-accurate transfers, use of freeze frames and random access to specific frames will be limited.

Information on field dominance must be provided. Tapes will be assumed to have field two dominance unless otherwise specified.

**Cues and Cue Insertion.** In order for 3M to apply videodisc address codes at the proper disc locations during mastering, the premastering facility must in some cases insert cues in the vertical intervals of the premaster tape. (See Section 4B.) These cues are electrical impulses that tell the 3M disc-mastering equipment where to lay down address codes on specific lines in the vertical intervals of the discs. The address codes on the disc are then read by the player. They may indicate frame numbers, the location of picture stops, or chapters—depending on the content of the program and the way it is intended to be used. (See Figure 3.1.1) Lines 10 to 18 are used in field one and lines 273 to 281 are used in field two.



The 3M Cue Inserter is used to put cues on the premaster tape. In response to these cues, the disc-mastering equipment assigns both 40-bit and 24-bit codes to specific frames on the premaster tape so that Scotch videodiscs can be played on all leading brands of optical disc players.

The cue inserter must be used for all frame-accurate transfers to tape of film shot at 24 fps and for some transfers of tape to tape. Specific applications are discussed in greater detail in the sections immediately following. Instructions for the use of the 3M Cue Inserter are provided in Section 4.

The correct placement and synchronization of cues should be determined by the production staff during Phase I of disc production, consistent with the kind of editing to be done and the type of equipment to be used. The premastering facility is responsible for inserting the desired cues in the correct places in the premaster tape. To do this, it must have video tape equipment that can place the cues on lines 15, 16, and 18 of the vertical interval. Equipment may have to be specially switched or modified to enable it to transfer these cues.

Single-frame edits may be required if the program contains single-frame information.

### Transferring Motion Picture Film to Premaster Tape with Frame Accuracy - CAV

If program material is initially shot on motion picture film, it is preferable to transfer it to video tape with frame accuracy for CAV-format videodiscs.

## Premastering

Because film can be shot at various speeds and video tape runs at a standard 30 frames per second, several additional considerations must be taken into account to avoid flicker.

**1) Film Shot at 24 fps.** One method for overcoming the incompatibility of film and video tape speeds is *3-2 pulldown*. In Figure 3.2A, assume that video tape and film are running side by side for one second. Film is normally shot at 24 fps, so 24 frames of film and 30 frames of video tape will pass in one second.

Field one and field two are diagrammatically represented in Figure 3.2A as circles. The fields are 1/60 second apart.

In the process of 3-2 pulldown, each film frame is assigned consecutively to either three or two video fields on the tape. Thus three tape fields bear the image from the first film frame, two tape fields bear the image from the second film frame, three from the fourth, two from the fifth, and so on, as shown in Figure 3.2B.

The problem is that two of every five video frames will consist of fields that contain information from two different film frames. The resulting effect is not noticeable during continuous play; but in freeze frame use of the videodisc player the image will appear to flicker between pictures from two different film frames whenever the laser happens to stop on a disc frame corresponding to a "bad" video frame (Figure 3.2C).

**Methods of Field/Frame Synchronization.** Such synchronization ambiguity can be eliminated during transfer by using a 3M Cue Inserter interfaced with a telecine and video tape recorder in a process known as *full-frame identification*.

During the film-to-tape transfer, a special circuit board (or *pulldown board*) can be rigged on a flying spot scanner to signal the 3M Cue Inserter to put "picture cues" in the vertical interval of the premaster tape. Each picture cue identifies the first video field that corresponds to a new film frame. (Figure 3.2D) Or, to put it another way, it identifies the field on which each complete picture begins.

The 3M videodisc mastering equipment later reads these picture cues on the premaster tape and combines the cued field with the field(s) immediately following it. These fields then comprise a single frame on the disc and are given an address code during disc mastering so that they can be randomly accessed by the disc player. The third field is also recorded on the disc, but it is not accessible.

The irregular placement of picture cues during pulldown creates difficulties in editing because the correct pattern of cues can be easily disrupted, creating a potential for flicker in subsequent frames. Thus *when rock-solid freeze frames are required, it is preferable that all editing be done with the 24 fps film before transfer to tape*. These implications are discussed in greater detail in Section 4.

Figure 3.2A. Different Rates of Motion for Video Tape and Film Shot at 24 Frames per Second

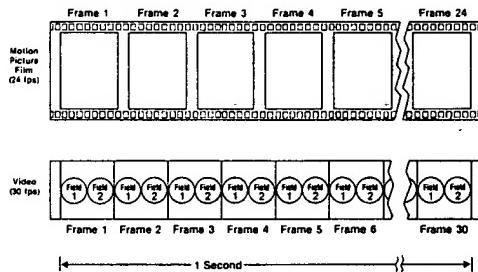


Figure 3.2B. Sequence of Film Frames and Video Fields Resulting from 3-2 Pulldown Transfers

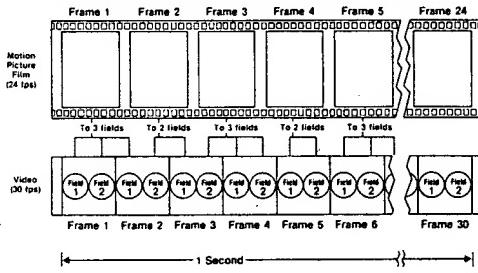
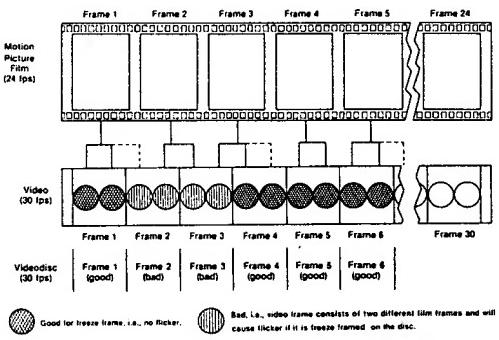


Figure 3.2C. Pattern of "Good" and "Bad" Frames Resulting From 3-2 Pulldown Transfer



# Premastering

Chapter cues and still cues must also be inserted in the video tape's vertical interval during the pulldown transfer if chapter codes or picture stop codes will be required in the final disc program. A teletype should be used with the 3M Cue Inserter in the manner outlined in Section 4.

If full-frame identification is not to be used during the pulldown transfer, good still frames may still be guaranteed in an alternative—if less elegant—way. Figure 3.3A illustrates how flicker can occur when full-frame identification is not used during the pulldown transfer. A stop command on "good" disc frames 1, 4, 5 or 6 would cause no problems. But stop commands on frames 2 or 3 would cause flicker.

Flicker-free text and other information can be assured if the same image is exposed on three consecutive film frames, as shown in Figure 3.3B.

The information on Frame 1 is accessible to at least one "good" video frame and one good disc frame. If the user happens to stop the player on a "bad" frame, flicker can be eliminated by simply stepping the player forward or backward one frame. Or if the disc is to be used on a player controlled by microprocessor, the computer program can be written in such a way that the good frames are accessed directly. Repeating the same information on several consecutive frames uses more disc capacity, however. Use of the cue inserter allows a more dense storage of images.

**2) Film Shot at 30 fps.** Film shot at 30 fps eliminates some of the complications related to 3-2 pulldown transfers—but not all. Since each film frame is transferred to two video fields in a consistent one-to-two pattern, picture cues are not strictly needed on the tape for full-frame identification. Program material can be edited either as film or tape. Unless special care is taken to control field dominance, however, the potential for flicker still arises.

In order to avoid flicker in tape segments originally shot in film at 30 fps, it is important to answer three questions before transfer:

- On which field (field one or field two) will the tape be edited?
- On which video field (field one or field two) will the flying spot scanner begin a new film frame? Or, in other words, what field dominance will the teletype establish during the transfer?
- What is the field dominance of the rest of the program?

Figure 3.2D. 3-2 Pulldown with Cues Inserted on Premaster Tape

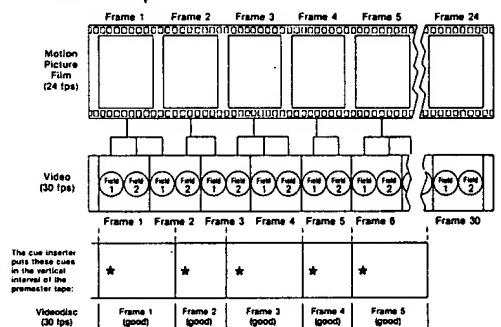


Figure 3.3A. Results of 3-2 Pulldown When no Cues are Inserted on the Premaster Tape

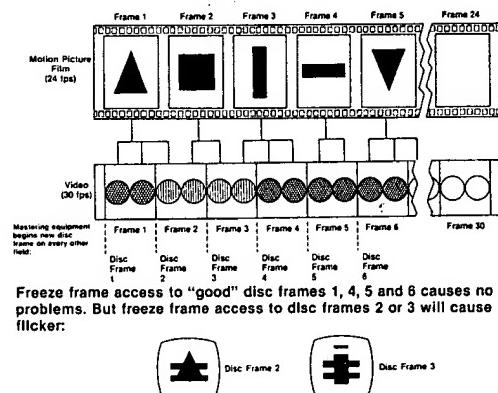
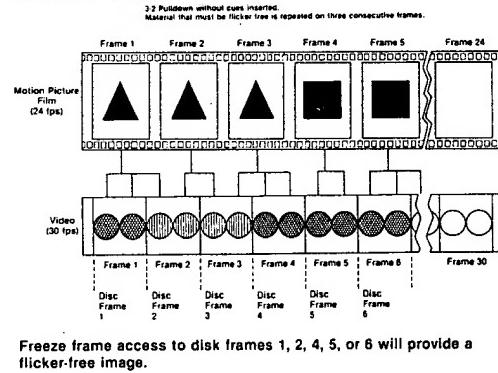


Figure 3.3B. 3-2 Pulldown Without Cues Inserted: Images are Repeated on Three Consecutive Frames to Avoid Flicker



## Premastering

As long as you arrive at the same answer to all three questions, you should have no trouble with flicker in the edited segments.

If, however, the telecine begins each film frame on video field one and your editing system edits on field two, flicker will be introduced throughout the edited segments. Figure 3.4A shows how fields would become mismatched if film were transferred in such a way that each frame begins on video field one when the editing system edits on field two.

Figure 3.4B shows the proper relationship between field dominance and edit points. Proper consistency of field dominance can be ensured by using the cue inserter to insert picture cues during transfer. This precaution will help eliminate the problem of mismatched fields.

It is also important to consider the field dominance of the rest of the tape because it must be kept consistent throughout the entire program. If field dominance changes during part of a program, picture cues must be inserted throughout the entire tape to tell the disc-mastering equipment where the changes occur. This procedure is discussed in greater detail in Section 4D.

### Transferring Slides to Premaster Tape

If video tape is to be used as an intermediate medium, standard care must be exercised with respect to edit points and color framing.

Information on field dominance is required. Field dominance is assumed to be field two unless otherwise specified.

Depending on the customer's needs, the 3M Cue Inserter may be used to insert cues that identify frame numbers, automatic stops and chapters.

The following three transfer methods are possible:

- Transfer of slides to video tape via camera or multiplexer.
- Transfer of slides to motion picture film, then to video tape.  
(A minimum of three film frames should be used per slide if the film is shot at 24 fps and there will be no full-frame identification signal from the telecine. One film frame per slide should be used if the film will be transferred directly to tape at 30 frames per second.)
- Digital frame storage editing may be used to transfer to video tape in real time.

**Transferring Other Media to Premaster Tape**  
The method for transferring slides to premaster tape may also be used for transferring microfilm, microfiche, filmstrips or electronically generated graphics.

Figure 3.4A. Mismatched Fields May Also Occur When Original-Source Material is Shot in Film at 30 Frames per Second

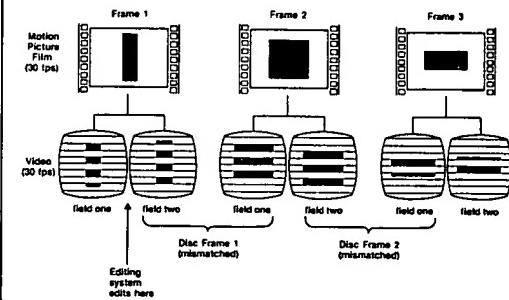
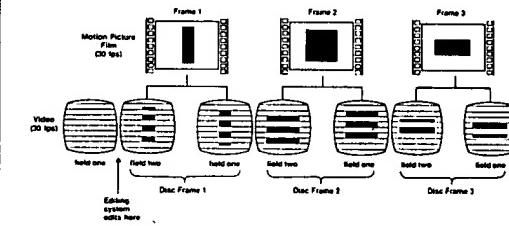


Figure 3.4B. The Proper Relationship of Field Dominance and Edit Points Eliminates Mismatching



## 4. Use of the 3M Cue Inserter

### 4A. Formatting of the CAV Videodisc

In order to clarify the function of the cue inserter, it may be helpful to first review how the CAV videodisc is formatted during 3M's mastering process.

#### For Premaster Tapes without Cues

The premaster tape should be submitted to 3M with its dominant field clearly identified on the "Scotch Videodisc Post Production Details Form." (A copy of this form is provided in the Appendix.) Field two dominance is assumed for premaster tapes unless otherwise indicated.

This information is then switched into the disc-mastering equipment, which scans the composite video signals as the premaster tape runs through. When a tape has been identified as having field two dominance, the disc-mastering equipment enters a frame address code on the master disc for every other field that passes, beginning with field two.\* (Figure 4.1)

A 40-bit frame number code is entered on line 10 and line 273 in the vertical interval of every frame on the master disc. (See Figure 4.2) This 40-bit code is read by the Pioneer players of the PR-7820 series; it tells such machines which frame they are reading. A 24-bit code is also entered on lines 17 and 18 or 280 and 281 of the vertical interval of the master disc to tell Sony, Sylvania, Magnavox, Pioneer and DVA PR-7810 players which frame they are reading.

\*For tapes of field one dominance, the code is put on the master disc for every other field, beginning with field one.

Figure 4.1. How the Disc-Mastering Equipment Reads Premaster Tapes That Do Not Have Cues

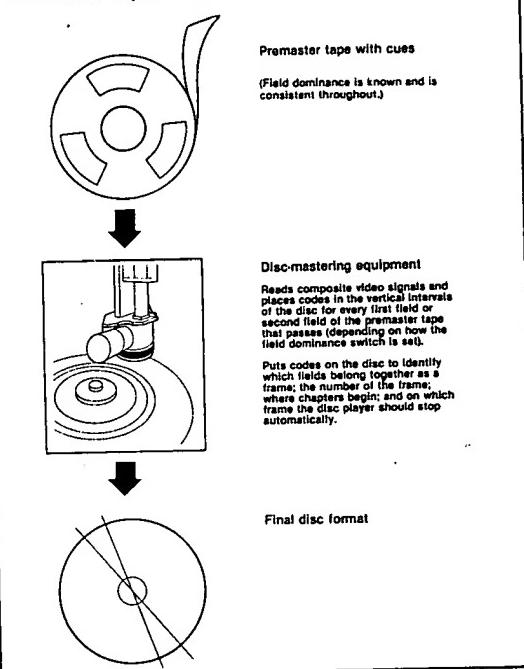


Figure 4.2. Location of the Address Codes in the Vertical Intervals of a Disc

(Field two is dominant in this example.)

Video Field 2	Video Field 1	
Frame number code**.....	273	10.....Frame number code**
Full-frame identification**.....	274	11
(also called "white flag")	275	12
	276	13
	277	14
	278	15
	279	16.....Picture stop code*
	280	17.....Chapter code*
Frame number code*.....	281	18.....Chapter code*

\*24-Bit Code

\*\*40-Bit Code

# Use of the 3M Cue Inserter

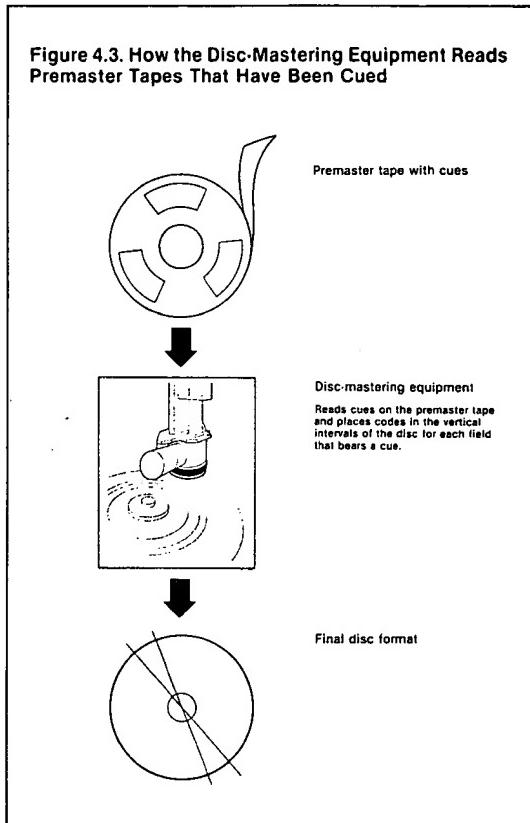
## For Premaster Tapes with Cues

Besides reading composite video signals, the disc-mastering equipment can also look for information contained in cues that may be placed on lines 15, 16 and 18 in the vertical interval of premaster tapes with field one dominance. For tapes of field two dominance, it reads cues in lines 278, 279 and 281.

These cues tell the disc-mastering equipment exactly where to put frame address codes, chapter codes and picture stop codes on the master disc (Figure 4.3). The mastering equipment must be switched to read either cues or composite video. Thus if cues are used in one segment of the premaster tape they must be used throughout. This includes both enabled video black sections.

Disc mastering is done in real time—once the mastering equipment has begun reading the information on the premaster tape, it cannot be interrupted until it has finished mastering a complete disc side.

Figure 4.3. How the Disc-Mastering Equipment Reads Premaster Tapes That Have Been Cued



## 4B. When to Use the Cue Inserter

The 3M Cue Inserter may be used in the automatic mode to add cues to the premaster tape during tape-to-tape transfers, film-to-tape transfers, or 3-2 pulldown transfers. It can also be used in the manual mode during tape edits.

The insertion of cues is strongly recommended for all program tapes to be mastered in the CAV format. When chapters and picture stops are to be encoded on the disc, the insertion of cues is essential.

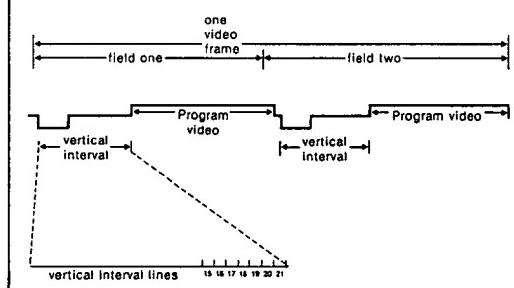
The cue inserter is used with tapes to be mastered in the CLV format only when chapterization is required on the final disc.

## 4C. How Cues Work

The cue inserter can be triggered by TTL active 0 inputs with 1K ohm pullup to +5 volts. This input may come from a variety of sources, including a pulldown board in a teletext, a tape editor or a computer. (The schematic diagrams in the Appendix show possible configurations.)

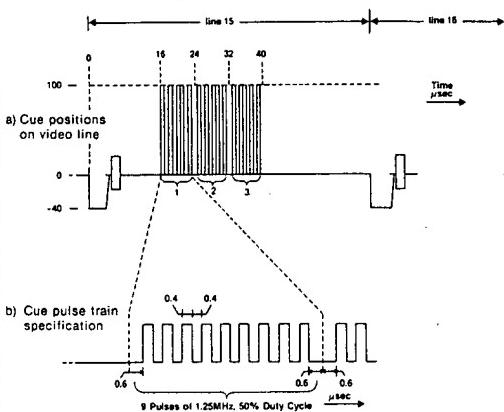
In response to these inputs, the cue inserter places cues on lines 15, 16 and 18 or lines 278, 279 and 281 in the vertical intervals of the *premaster tape*, depending on its field dominance (Figure 4.4A). Each cue consists of a cluster of nine clock pulses (Figure 4.4B). These are visible in the vertical interval on a television monitor or a waveform monitor.

Figure 4.4A. Location of Cues in the Vertical Interval of the Premaster Tape



# Use of the 3M Cue Inserter

Figure 4.4B. Pulse Train Specifications for Cues on the Premaster Tape



Chapter numbers should not exceed the number 79.

The procedure for insertion of chapter cues is basically the same whether the disc is to be mastered in the CAV or the CLV format. There is one important exception. If cues are used for any part of a premaster tape intended for CAV mastering, they must be used throughout. But in tapes intended for CLV mastering, cues may be used only in frames where new chapters are to begin; they need not be used throughout. For both the CAV and CLV formats, picture cues must always be inserted at the same time as chapter cues.

Remember that the chapter cue appears on one and only one *premaster tape frame* for each new chapter. This is because each and every premaster tape frame that bears a chapter cue is interpreted by the disc-mastering equipment as a new and entirely

## 1) Picture Cues

The first set of nine pulses is a picture cue that identifies the start of a complete frame. Each time one of these picture cues passes through the mastering equipment, it triggers a frame counter, and the disc-mastering equipment encodes the frame number on the disc. Forty-bit frame number codes are entered on lines 10 and 273 of the disc's vertical interval, just as they are for tapes that are not cued. Likewise, 24-bit codes are also entered on lines 17 and 18 or 280 and 281 of the disc's vertical interval, depending on the field dominance of the frame. Figure 4.5A shows the location of the picture cue on line 15 (or line 278 for field two dominance) of the premaster tape.

## 2) Chapter Cues

A second set of nine pulses (Figure 4.5B) identifies a tape frame as the first frame of a new chapter.

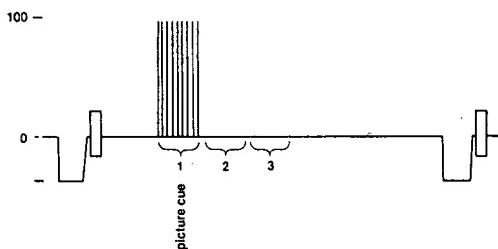
*Chapter cues can be applied only at the same time as picture cues; they cannot be used independently of picture cues.*

Each time the disc-mastering equipment reads a chapter cue on the premaster tape, the disc chapter-number code advances to the next higher integer, starting with zero and running through 79. This chapter number code is inserted in the vertical interval of every disc frame until the next chapter cue on the premaster tape triggers insertion of the next higher chapter number on the disc.

The disc-mastering equipment also encodes a *chapter stop* code on the first 400 frames of each new chapter. (See "chapters" in Section 1.)

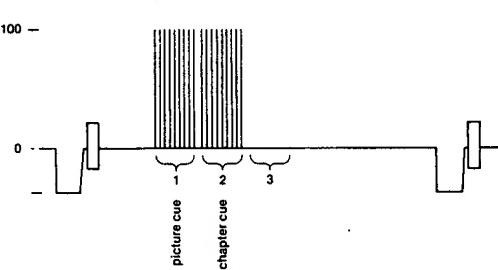
The first frame of every chaptered videodisc is assigned a chapter number. The number desired for this first chapter should be indicated on the Post Production Details form.

Figure 4.5A. Location of the Picture Cue



The picture cue identifies the start of a video frame containing a complete picture. It must be present in all frames of the active program of the tape if any cues are to be used in any parts of the tape.

Figure 4.5B. Location of the Chapter Cue



The chapter cue is shown here in relation to the picture cue. If such a cue is to be used, it is always inserted at the same time as the picture cue; it cannot be used without it. This combination of cues identifies a tape frame as the first picture of a new chapter.

# Use of the 3M Cue Inserter

different chapter; it is assigned the next higher chapter number.

### 3) Still Cues

A third series of nine pulses on the premaster tape tells the disc-mastering equipment to place a code on the disc to automatically switch the disc player to still frame mode from the play mode. (Figure 4.5C). Like the chapter cue, it cannot be entered on the premaster tape unless the picture cue is entered at the same time. But the chapter cue and the still cue may be used independently of each other.

### 3M Cue Inserter Specifications

#### Input

Power	115 volts AC, 60Hz, .5 amp
Signal	Video composite 1 volt peak to peak (p/p) into 75 ohm. Input impedance is internal 75 ohm.

Tape cues and film cues	All cue commands are TTL active 0 with 1K ohm pullup to +5 volts.
-------------------------	---

#### Outputs

Signal	Video output composite 1. volt p/p into 75 ohm output impedance.
--------	--

Controls	(See Figure 4.6)
1. POWER Switch	Turns cue inserter on and off.
2. TAPE/FILM Select Switch	Selects tape or film mode.
3. Cue Enable Switches	In the "on" position, these allow the insertion of frame number address cues, chapter cues and frame stop or "still" cues.

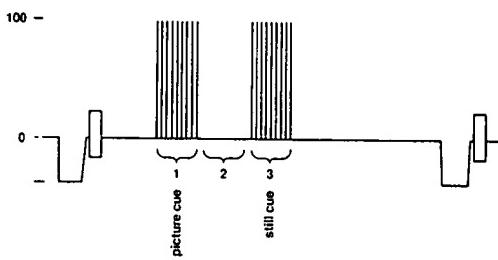
- a. PICTURE Cue Enable
- b. CHAPTER Cue Enable
- c. STILL Cue Enable

4. FIELD 1/2 Select Switch	Selects which field cues are to be inserted into. Represents the first field of the video frame.
5. MANUAL/AUTO Select Switch	Chooses either manual or automatic insertion of chapter cues and frame stop cues in the tape mode.

#### CAUTION: Internal shock hazard

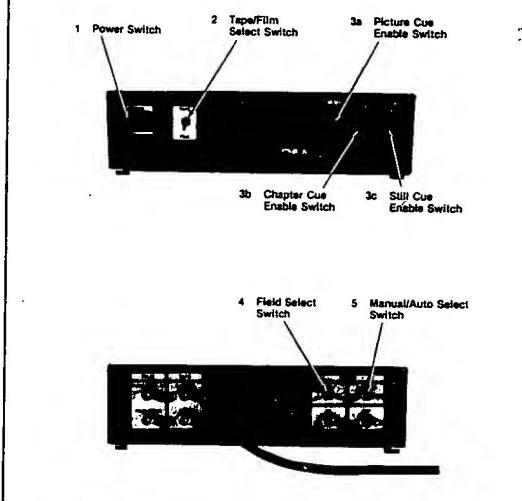
The cover of the cue inserter is to be removed by qualified personnel only. To remove cover, disconnect current and then remove screws holding the feet. Slide the cover to the front, giving access to circuit boards.

**Figure 4.5C. Location of the Still Cue**



Cue 3 is the still cue. If it is to be used, it is always inserted at the same time as the picture cue; it cannot be used without it. This combination of cues 1 and 3 identifies a tape frame in such a way that the disc player will be commanded to switch automatically to still frame play.

**Figure 4.6. 3M Cue Inserter**



# Use of the 3M Cue Inserter

## 4D. Modes of Operation - Cue Inserter

The 3M Cue Inserter may be used with video tape original-source material in either the manual mode (during edits, for example) or in the automatic mode (during real-time transfers). Possible configurations of equipment for each mode are presented schematically in the Appendix.

### 1) Using the Inserter with Video Tape - Manual Mode

The MANUAL/AUTO Select Switch (Figure 4.6, 5) should be in the MANUAL position; the TAPE/FILM Select Switch (2) should be in the TAPE position; the POWER Switch (1) should be turned on; and the PICTURE Cue Enable Switch (3a) should be on.

**Inserting Picture Cues Manually.** Insertion of picture cues is required if chapter or stop codes are to be mastered on the disc. It is also required when solid still frames are needed and the premaster tape is to be made from segments of inconsistent field dominance.

The picture cue, you will recall, tells the 3M disc-mastering equipment to put a frame address code on specific fields of the disc. The code on the disc then tells the disc player which fields to read together as a complete frame, and it identifies the number of the frame the player is reading at any moment of play.

In order to insert a picture cue, the operator of the cue inserter must first determine which field is dominant in the tape segment to be cued. A technique for determining field dominance is provided in the Appendix. This information is essential. Mismatched fields will result if the field dominance is incorrectly entered.

For tapes of field two dominance the FIELD 1/2 Select Switch should be in the FIELD 2 position; for tapes of field one dominance it should be in the FIELD 1 position.

**Inserting Chapter Cues Manually.** Insertion of chapter cues is optional, depending on the program's design and its intended use. If chapter codes are going to be used on the disc, chapter cues must be inserted on the premaster tape at the same time as picture cues.

The PICTURE Cue Enable Switch must therefore be turned on whenever chapter cues are being inserted.

Each and every tape frame that bears a chapter cue will be read by the disc-mastering equipment as the beginning of an entirely new chapter, so the cue must be placed on the first and only the first frame of each chapter.

In manual operation, your equipment may be unable to put a chapter cue on only one frame at a time. This is because the cue inserter will place a chapter cue on every passing frame, as long as the CHAPTER Cue Enable Switch and the PICTURE Cue Enable Switch are turned on.

Suppose, for example, that a chapter cue is desired at Frame X in Figure 4.7A. In manual operation, your equipment may be unable to place it on Frame X only, so the cue will also be recorded on frames X+1, X+2 . . . X+n. Each of the frames following Frame X would then be interpreted by the mastering machine as an entirely new chapter. To avoid this problem and to put a cue on Frame X only, it may be necessary to back up the recorder to Frame X+1 (Figure 4.7B) and re-record with the CHAPTER Cue Enable Switch off. This procedure will erase the cues from frames X+1, X+2 . . . X+n, leaving one cue on Frame X only.

Figures 4.7A & 4.7B. Procedure for Manual Insertion of Cues

Figure 4.7A.

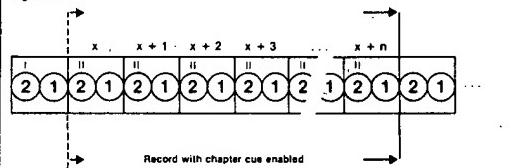
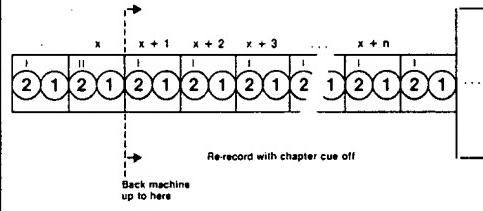


Figure 4.7B.



# Use of the 3M Cue Inserter

**Inserting Still Cues Manually.** Insertion of still cues is optional, depending on the program's design and its intended use.

Still cues are manually inserted in the same way as chapter cues. The PICTURE Cue Enable Switch must be on.

Chapter and still cues may be used independently of one another.

## Examples and Implications

*Tapes with consistent field dominance throughout*  
The following example is provided to help illustrate the manual use of the 3M Cue Inserter with video tape of consistent field dominance on field two.

Suppose (Figure 4.8) that you have three segments of video tape to be edited together with cues inserted as shown. Cues must be used on all segments of premaster tapes intended for CAV mastering if they are used on any. Chapter and still cues must be inserted at the same time as picture cues; the PICTURE Cue Enable Switch will be turned on throughout the entire recording.

**Step 1.** Record from Frame 1 of Segment A with the PICTURE Cue Enable Switch depressed. The FIELD 1/FIELD 2 Select Switch is set to FIELD 2, consistent with the field dominance of all tape segments; the AUTO/MANUAL Select Switch is on MANUAL.

Stop the recorder after Frame 210 (Figure 4.9A). Picture cues are now applied in the first field of every frame from 1 through 210.

**Step 2.** Now also depress the CHAPTER Cue Enable Switch and turn the recorder back on briefly. This procedure applies picture cues and chapter cues on all frames from 211 through frame "n", depending on the capabilities of the recorder. (Figure 4.9B)

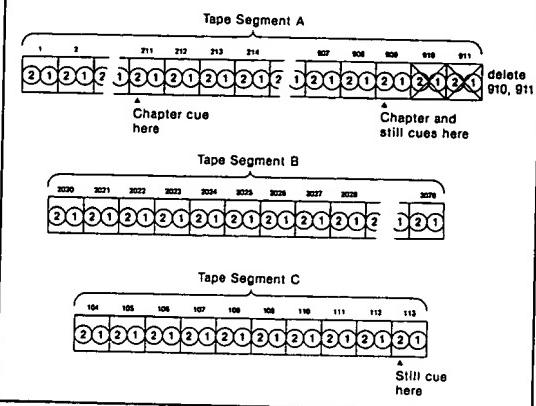
**Step 3.** Back up the recorder to after Frame 211. Turn off the CHAPTER Cue Enable Switch and begin recording again. Edit out frames 214-240 and continue recording through Frame 908.

This procedure applies picture cues to all frames from 212 through 908, as shown in Figure 4.9C.

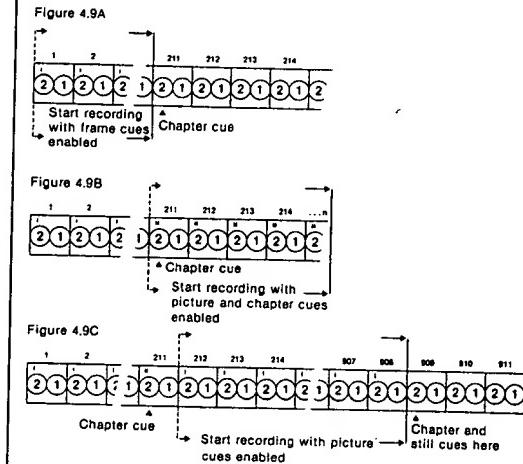
**Step 4.** Depress the CHAPTER Cue Enable Switch and the STILL Cue Enable Switch. Record through Frame 909 and stop the recorder immediately, as in Step 2. (Figure 4.9D)

**Step 5.** Back up the recorder to just after Frame 909. Turn off the CHAPTER and STILL cue enable switches and begin recording straight through Segment B. Edit in Segment C and continue recording through Frame 112. This procedure yields the results shown in Figure 4.9E.

**Figure 4.8. Three Tape Segments to be Edited Together and Cued**



**Figure 4.9A to 4.9C. Sample Procedure for Editing and Manual Cue Insertion**



## Use of the 3M Cue Inserter

**Step 6.** Turn on the STILL Cue Enable Switch. Record through Frame 13 to a convenient stopping point (Figure 4.9F). Back up the recorder to Frame 114. Turn off the STILL Cue Enable Switch and then record picture cues to the end of the tape (Figure 4.9G).

### Tapes with inconsistent field dominance

The cue inserter may also be used to avoid the problems of video flicker when tape segments are not of the same field dominance throughout the program.

Suppose in this case you have tape Segments A, B and C, with Segments A and C of field two dominance, and Segment B of field one dominance. In order to edit any part of Segment B with the other two, its leading fields must first be identified with picture cues. And if cues are used on one segment of the premaster tape, they must be used throughout. It will therefore be necessary to cue Segments A and C as well.

For the sake of simplicity, we will assume that no chapter cues or still cues are required in the final program. If they were required, they would be

Figure 4.9D.

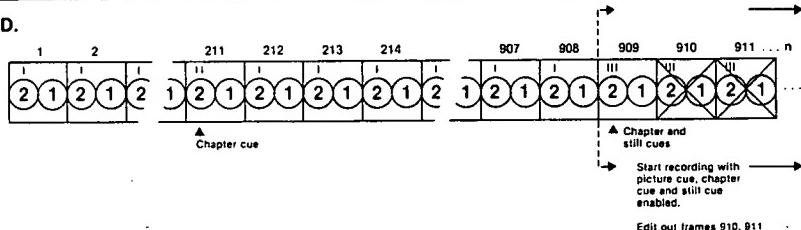


Figure 4.9E.

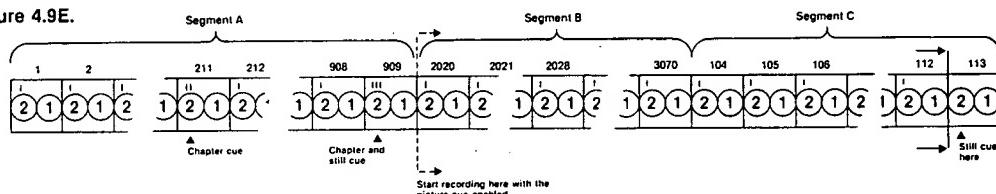


Figure 4.9F.

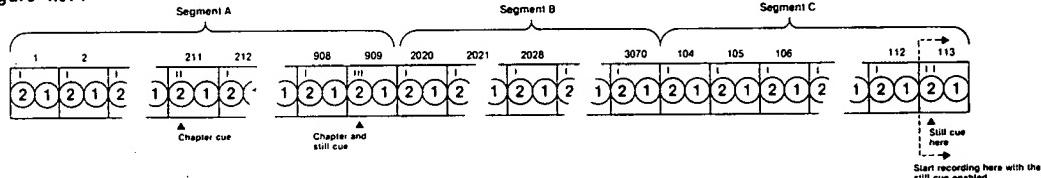
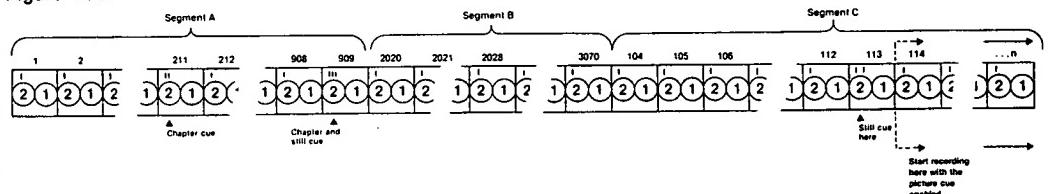


Figure 4.9G.



## Use of the 3M Cue Inserter

inserted manually in the manner described in the preceding example or automatically in the manner described in the following section. Because picture cues, chapter cues and still cues must all be inserted during the same step, they would have to be put into Segments A, B and C before the segments are edited together.

Since no chapter cues or still cues are required in the final program, picture cues can be inserted in field two of each frame in Segments A and C during a nonstop transfer. Picture cues can be inserted in field one of each frame in Segment B during the same kind of procedure. The result is shown in Figure 4.10.

Once they are cued in this manner, the tape segments may be edited together in any way the program requires. But if the editing equipment should happen to drop a field between segments, a bad frame could occur at the edit point (Figure 4.11).

### 2) Using the Cue Inserter with Video Tape - Automatic Mode

The MANUAL/AUTO Select Switch should be in the AUTO position; the TAPE/FILM Select Switch should be in the TAPE position; the POWER Switch should be turned on; and the PICTURE Cue Enable Switch should be depressed.

**Inserting Picture Cues Automatically.** The insertion of picture cues is required under the same circumstances as those outlined in the preceding paragraphs on manual insertion. The procedures are also the same.

**Inserting Chapter Cues Automatically.** This procedure is optional, depending on the program's design and its intended use.

Figure 4.10. Picture Cues Inserted to Remedy the Problem of Inconsistent Field Dominance

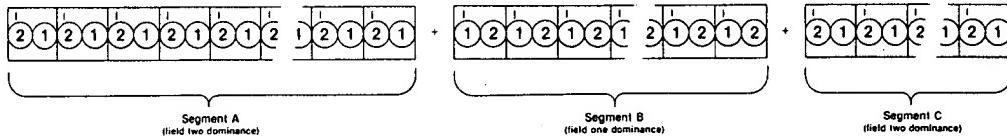
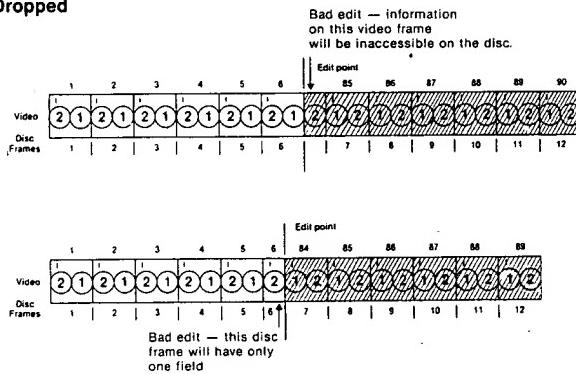


Figure 4.11. Bad Frames will Occur at Edit Points If a Field is Inadvertently Dropped



If a field is inadvertently dropped when cued segments of tape with field one dominance are edited to cued segments of field two dominance, a bad disc frame results at the edit point.

## Use of the 3M Cue Inserter

Film shot at 24 fps should be edited as film before it is transferred. Complications will arise if you try to edit tape carrying picture cues from 3-2 pulldown because it is difficult to keep track of the locations of the picture cues on the tape. Edits may combine video fields in such a way that they will be mismatched on the disc, creating a bad frame at the edit point. (Figure 4.13)

If chapter or still locations are to be used in segments originally shot in film at 24 fps, these cues must also be applied to the tape during pulldown transfer. This is because chapter cues and still cues cannot be inserted later, independently of picture cues. And since cues can be inserted only in the automatic mode during film transfers, a system must be devised to automatically trigger the cue inserter as the proper chapter and still frames pass through the film scanner.

The first-field identification input is an active-low command. In order for it to properly trigger the cue inserter, it must occur after line 21 (or line 284) of the field immediately preceding each good frame and before line 14 (or line 277) of the first field of each good frame.

### 2) Inserting Chapter and Still Cues Automatically

This operation is optional, depending on the program's design and its intended use.

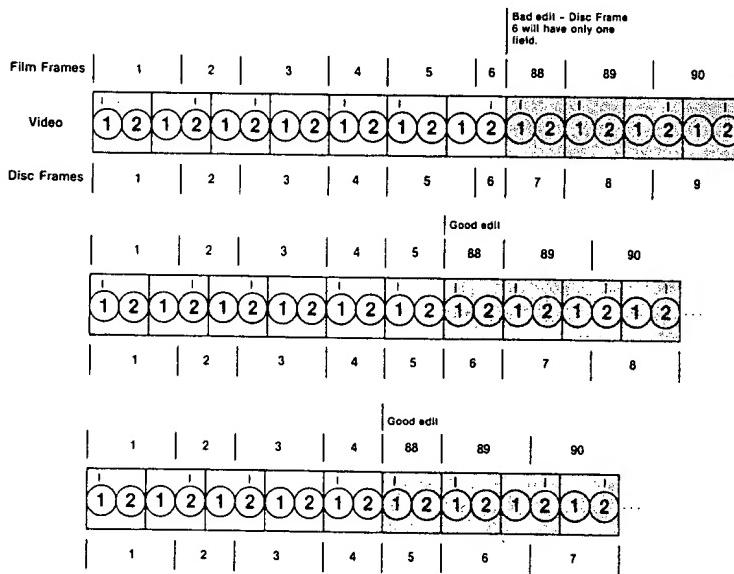
The film index input from the film scanner is an active-low command pulse that tells the 3M Cue Inserter to put a cue at a specific location on the premaster tape. This location may be a chapter beginning, a still frame, or both.

In order for the film index input to properly activate the inserter, it must occur after the leading edge of the film pulldown pulse and before line 14 (or line 277) of the first field of the video frame.

The sequence of the film index command pulses identifies which cue is to be inserted. A chapter location is indicated by a single frame index pulse and a still location by two pulses. Three successive pulses (occurring within the same time interval as specified in the preceding paragraph) indicate that a chapter cue and a still cue are to be inserted together at the same location.

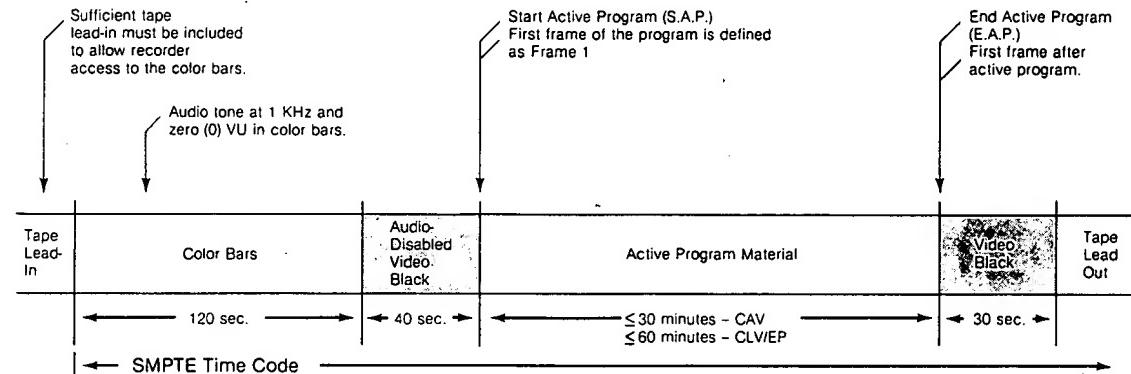
Thus is possible to trigger the cue inserter to enter chapter and still cues on the premaster tape during film transfers. This might be done by using reflective foil to mark the film frames where cues are desired. A photosensor on the telecine could be wired to send an input pulse to the cue inserter to enter a chapter cue on the tape; a second piece of foil could be made to trigger a double pulse that tells the cue inserter to enter a still location. Three pieces of foil would signal the insertion of a combined chapter and still location.

Figure 4.13. Complications Arise in Editing Tape Cued During 3-2 Pulldown



## Appendix

### Diagrammatic Summary: Format for Video Tapes to be Used in Videodisc Mastering



\*SMPTE time must be present from the beginning of color bars through the end of video black.  
The time code must be continuous and always increasing.

- Constant Angular Velocity (CAV) Program –
- Program Length = 0 to 30 mins.
  - Cues – Optional. (Frame, Chapter & Stop)
  - Field Dominance – Must be specified, if tape is not cued.
  - SMPTE Time Code – Must be continuous & increasing.
- Constant Linear Velocity (CLV)/Extended Play (EP)
- Program Length = 0 to 60 mins.
  - Cues – Optional (Chapter Only)
  - Field Dominance – Information not needed.
  - SMPTE Time Code – Must be continuous & increasing.

## Appendix

### Final Checklist for Premaster Tapes

- |   |                                 |                                   |
|---|---------------------------------|-----------------------------------|
| 1. Video tape 3/4-inch professional or 1-inch C-composite NTSC-M525 line 60Hz format?   | <input type="checkbox"/> 1-Inch | <input type="checkbox"/> 3/4-Inch |
| 2. Non-drop frame SMPTE time code placed on cue track (channel 3 audio)?  | <input type="checkbox"/> Yes    | <input type="checkbox"/> No       |
| 3. Control track continuous?  | <input type="checkbox"/> Yes    | <input type="checkbox"/> No       |
| 4. Maximum luminance of video signal does not exceed 110 IRE?   | <input type="checkbox"/> Yes    | <input type="checkbox"/> No       |
| 5. Chroma level does not exceed 100% modulation?  | <input type="checkbox"/> Yes    | <input type="checkbox"/> No       |
| 6. Video signal/noise 45dB minimum unweighted, 10KHz to 4.2MHz black and white at 50 IRE flat field level?                                | <input type="checkbox"/> Yes    | <input type="checkbox"/> No       |
| 7. Audio levels consistent with a reference level of zero (0) VU with short-term peaks not exceeding 3dB?                                 | <input type="checkbox"/> Yes    | <input type="checkbox"/> No       |
| 8. Specified which tape audio channel (1 or 2) is to be on which disc audio channel(s)?   | <input type="checkbox"/> Yes    | <input type="checkbox"/> No       |
| 9. Does video tape lead-in have 2 minutes of color bar 75% chroma with a known luminance reference followed by 40 seconds of video black? | <input type="checkbox"/> Yes    | <input type="checkbox"/> No       |
| 10. Does audio of tape lead-in have a level of 1KHz at zero (0) VU during color bar (1 minute of tone at 1KHz)?                           | <input type="checkbox"/> Yes    | <input type="checkbox"/> No       |
| 11. Does tape lead-out have a minimum of 30 seconds of video black following active program?  | <input type="checkbox"/> Yes    | <input type="checkbox"/> No       |

Customer Name:

Program Title:

Date:

# Appendix

## Scotch Videodisc Post Production Details

Please type, filling in form completely.

Your order may not be correctly mastered without complete and accurate information.

Date: \_\_\_\_\_

### Customer:

Name \_\_\_\_\_

Address \_\_\_\_\_

City, State \_\_\_\_\_ Zip \_\_\_\_\_

Contact \_\_\_\_\_ Phone \_\_\_\_\_

Customer 3M Purchase Order No. \_\_\_\_\_

Short Program Title: Side 1 \_\_\_\_\_ Side 2 \_\_\_\_\_

	Side 1	Side 2
	Field dominance <input type="checkbox"/> 1st <input type="checkbox"/> 2nd (required for CAV only)	Field dominance <input type="checkbox"/> 1st <input type="checkbox"/> 2nd (required for CAV only)
Video (required for all orders)	First frame at: _____ (SMPTE Last frame at: _____ code) Playing time: _____ (minutes)	First frame at: _____ (SMPTE Last frame at: _____ code) Playing time: _____ (minutes)
Audio (required for all orders)	<input type="checkbox"/> Mono <input type="checkbox"/> Dual independent <input type="checkbox"/> Stereo <input type="checkbox"/> None Tape channel 1 to disc channel(s) _____ Tape channel 2 to disc channel(s) _____ Dolby decoding needed? <input type="checkbox"/> Yes <input type="checkbox"/> No CX encoding needed? <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Mono <input type="checkbox"/> Dual independent <input type="checkbox"/> Stereo <input type="checkbox"/> None Tape channel 1 to disc channel(s) _____ Tape channel 2 to disc channel(s) _____ Dolby decoding needed? <input type="checkbox"/> Yes <input type="checkbox"/> No CX encoding needed? <input type="checkbox"/> Yes <input type="checkbox"/> No

Record Format:  CAV  CLV  
 Level 2 (with digital program dumps encoded. Check appropriate format.)  Sony format  Pioneer format,  
 both Sony & Pioneer formats

Are cues present on premaster tape?  Yes  No

Locations of chapters, picture stops and program dumps must have the first frame of the event listed. Use non-drop frame time code to identify each. If more space is needed, please attach additional copies of the same form.

Chapter(s) (CAV & CLV)		Picture Stop(s) (CAV)		Program Dump(s) (Level 2 CAV)	
First frame of active program should have chapter no. (Choose nos. 0-79)	First frame of active program should have chapter no. (Choose nos. 0-79)	Side 1: Frame No.	Side 2: Frame No.	Side 1: Frame No.	Side 2: Frame No.
Begin next chapters on frame no.: _____ _____ _____ _____ _____ _____ _____	Begin next chapters on frame no.: _____ _____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____

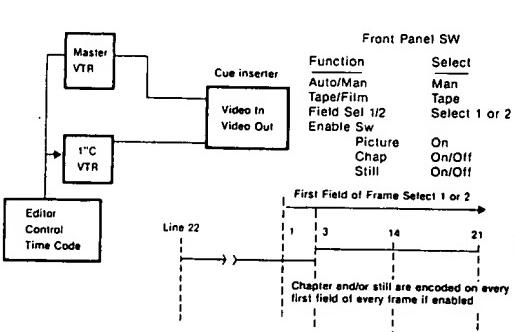
To the Customer: Please retain customer copy and forward others with final checklist form and premaster tape to:

Optical Recording Project/3M  
 Menomonie Plant  
 1425 Parkway Drive  
 Menomonie, WI 54751

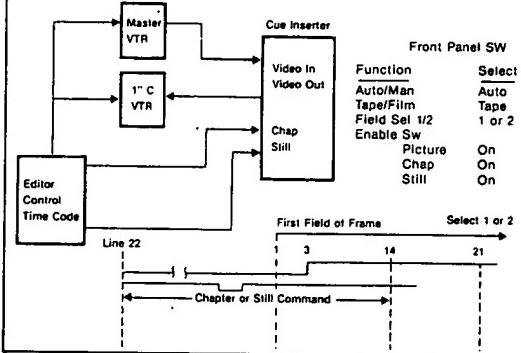
Premaster tapes cannot be checked in without completed Post Production Details and Final Checklist for Premaster Tape forms.

## Appendix

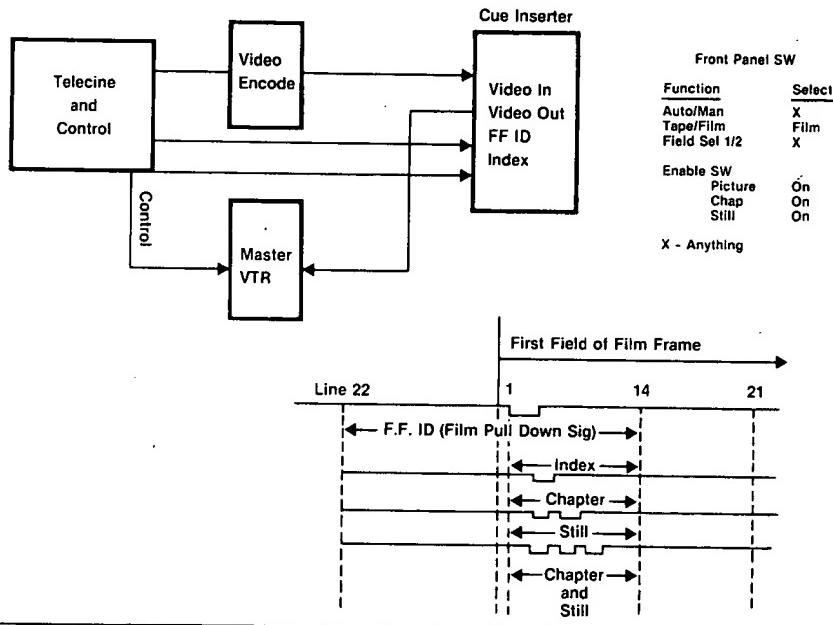
**Wiring Diagram for Use of the 3M Cue Inserter:**  
Video Tape, Manual Mode



**Wiring Diagram for Use of the 3M Cue Inserter:**  
Video Tape, Automatic Mode



**Wiring Diagram for Use of the 3M Cue Inserter:**  
Motion Picture Film, Automatic Mode



# Appendix

## Determining Field Dominance

The following procedure can be used to determine the field dominance of a 1" Type C NTSC premaster tape. This determination must be made or verified before a tape is used to make a CAV videodisc in which the mismatching of video fields may cause flicker when the videodisc is played in the still frame or freeze frame mode.

1. The first step in determining the field dominance of a video tape is to identify the two different video fields. This can be done on a waveform monitor. The video fields look very similar on such a monitor, except for a section of the fields at or adjacent to the vertical interval. When the vertical interval is displayed on a waveform monitor, the following features can be used to identify which video field is being observed (Figure A):

### Characteristics of Video Field One

- No video is present on line 21 (although the closed caption option information may be there).
- Line 22 is a full video line with video information on the entire line.
- Line 9 will be part of the half line equalization pulse section, and all full video lines will have a color burst.
- The last line of the previous field (Line 525, field 2) will be a full video line.

### Characteristics of Video Field Two

- Line 284 (equivalent to Line 21 of field one) will contain a half line of video information (although the first half line may have closed caption information).
- Line 272 (equivalent to line 9 of field one) will be a full video line but will not have a color burst on it.
- The last line of the previous field (Line 263, field two) will be only half a line of video.

In order to make an accurate determination, all of these points must be examined:

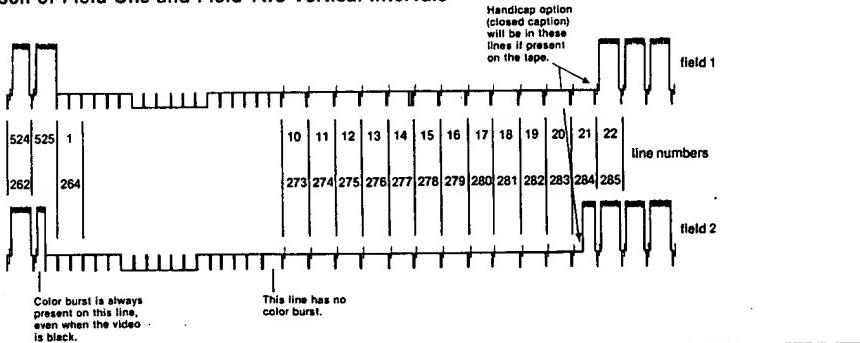
- Sometimes video may be present before lines 21 or 284. This is particularly true for material originally shot on 3/4-inch video cassette recorder (VCR). Not all TV cameras may blank the proper lines, and the tape will not conform to 3M specification. Tapes not meeting specification cannot be mastered even though they may still be playable.
- If the 1-inch video tape recorder (VTR) does not have a sync head, part of the vertical interval will be missing; reading of line 9 or line 272 may be impossible.
- When trying to identify the half-lines at the beginnings or ends of the field, note that it is possible to have one or both at black or below-black levels. This will be misleading, because they will then appear the same length as their neighboring lines.

Figure A illustrates what idealized vertical intervals look like on a waveform monitor.

2. The second step in determining field dominance requires use of a 1-inch VTR along with a waveform monitor capable of displaying the entire vertical interval area and a Tektronix TV monitor (Figure B & C). The procedure is intended to be compatible with most 1-inch VTR's.

When the VTR is executing a still frame, it reads only a single field and not a full (two-field) frame. Because of this, the signal used on the waveform monitor must be the raw video signal from the tape recorder without going through a time base corrector. If the time base corrector is left on, it will simulate both video fields even though the VTR is scanning only a single field.

Figure A. Comparison of Field One and Field Two Vertical Intervals



## Appendix

Use the following procedure to look at the leading field of a new picture:

- a. Load the tape onto the VTR.
- b. Advance the tape forward, using the SHUTTLE mode or FAST FORWARD.
- c. Observe the video content, and when a sudden high-contrast change occurs (in either color, brightness, or picture content), stop the tape. (This scanning can also be done while the tape is played forward in the normal PLAY mode, but it requires more time to do it in this mode.)
- d. Using the SHUTTLE mode, rewind the tape slowly. Locate the area with the high contrast or an edit point, and once near this point, press STOP.
- e. Press the JOG button and using the control knob, move the tape forward or backward as required to position the tape in such a manner that the top half and the bottom half of the TV screen display different pictures. (Figure D)

When the tape is positioned in this manner, you can see the vertical interval of the first field of the new picture on the top half of the waveform monitor. Using the criteria described earlier, you can identify which field is the first field of the new picture.

You should evaluate the tape at several points, especially if the original material used in making the tape varies throughout (e.g. if slides, film, 3/4-inch tape or video tape are mixed into a single 1-inch tape). Materials originated from such diverse sources are likely to have many edit points and thus many possible changes in field dominance.

If the first field of the new picture is video field one, then that frame is field one dominant. If the first picture field is video field two, then that frame is field two dominant.

On most tapes it is also possible to look at the vertical interval on the TV monitor and see if the

half lines are present (field two dominant) or if only whole lines are present (field one dominant). Figures E and F.

Exercise caution in using the VTR in the still frame mode of operation. If the tape is left in one position for very long it may become polished, causing tape degradation.

**Figure C. Settings For Determination of Field Dominance**

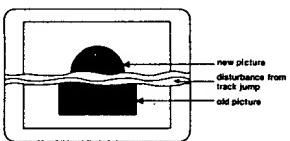
**Tektronix 1480 Waveform Monitor**

INPUT - A or B DC coupled  
VOLTS FULL SCALE - 1.0 or 0.5  
RESPONSE - Flat  
DC RESTORER - Slow & Back Porch  
OPERICAL - Oper.  
VERTICAL POSITION - Adjust as required  
MAGNIFIER - X20 to look at vertical interval  
- X50 to expand specific section  
DISPLAY - 2 field  
LINE SELECTOR - Variable button in  
- Knob settings - N.A.  
FIELD - 1/1 (1/3) or 2/2 (2/4)  
SYNC - Int.  
- AFC  
HORIZONTAL POSITION - Adjust as required

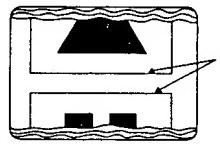
**Tektronix 650 Color Picture Monitor**

INPUT - A or B  
SYNC - Int.  
MODE - Auto  
SIZE - Reduced  
SCAN - Vertical Delay  
BRITNESS/CONTRAST/CHROMA/HUE - All at preset

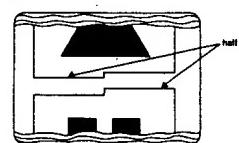
**Figure D. Video Tape is Jogged Until Top and Bottom Halves of Screen Show Different Pictures**



**Figures E & F. Comparison of Field One and Field Two Dominant Tapes on a Waveform Monitor.**

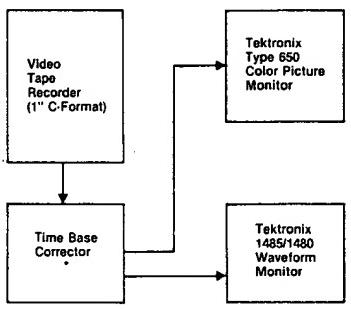


**E. Field One Dominant**  
(Fields begin and end with a whole line.)



**F. Field Two Dominant**  
(Fields begin and end with a half line.)

**Figure B. Connection Diagram: Setup for Determining Field Dominance**





M-OR-PPP1183(1231)TP

**Optical Recording Project/3M**  
223-5S 3M Center  
St. Paul, MN 55144